Volume 1, Issue 1 JUNE/JULY 1998

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Part 1

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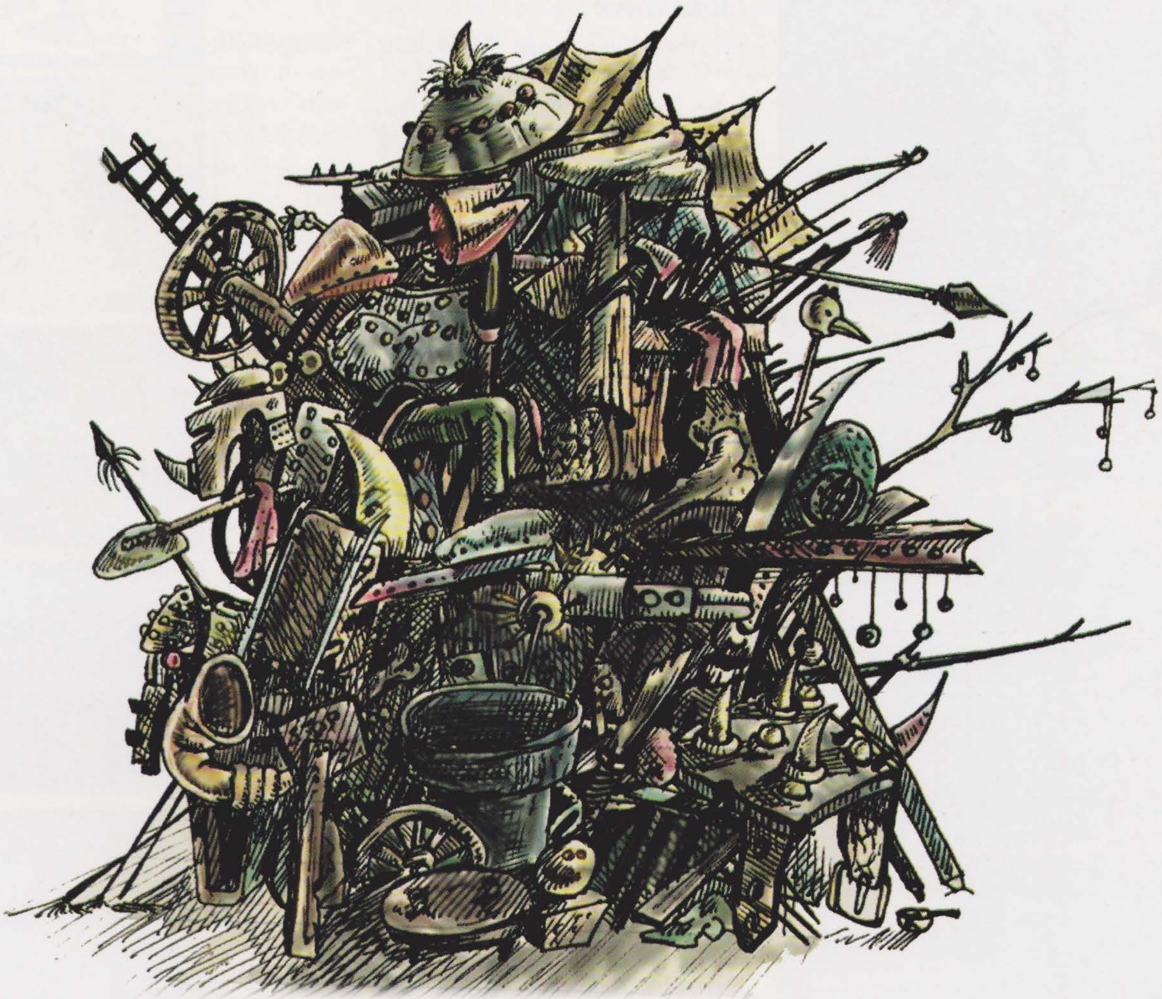
Each issue we will host a new 3D competition that's open to all Serious 3D subscribers. Now I know what you're thinking - only the super talented guys with $20K programs will win. Well, that's not the way we do things here at Serious 3D. It doesn't matter if you are using a super computer with outrageous software or a simple PC with something you downloaded from the Internet. We judge the contests on creativity, rather than technical merit. That's right, finally a contest for 3D artists that's about artistic talent, not engineering skill! We judge the entries on pure creativity alone. Show us just how artistic you can be, let us see your imagination at work.



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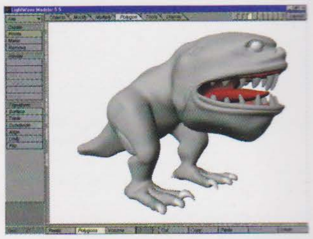

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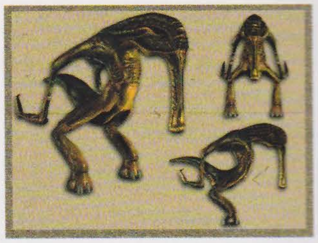

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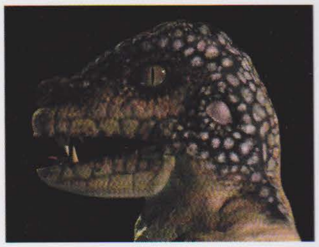

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Editor's Desk

Rantings from the Editor in Chief

Welcome to the premiere issue of Serious 3D magazine! Have you ever tried to find decent tutorials? Not just basic material (seen so frequently in 3D magazines and on the net) - I'm talking about professional level tutorials, with a high level of detail and objectives? When I first began working with 3D graphics, my own hunt for educational material was certainly disappointing. Back then I figured the industry was so immature that little had been written. Well, as the years passed, nothing changed! The magazines kept printing the same 'stick figure' tutorials, and the net became nothing more than a plethora of defunct links and general disappointments.

While the 3D industry may still be maturing, it has certainly evolved enough to supply a number of authorities capable of sharing tips and techniques. That's what Serious 3D is all about. We've assembled the finest team of writers and educators in the 3D industry. We've also taken an entirely different approach to presenting information. Yes, we're breaking the rules of publishing! About time, isn't it? Aren't we all tired of magazines and books that are nothing more than creative rewrites of user manuals? Sure, user manuals often are poorly written. Still, we don't want to pay $50 just to have someone clarify the simple tutorials, do we? What we need are truly insightful tutorials, ones that spark our imaginations, pushing us to the true limits of our capabilities.

I've found that the only thing separating the amateur from the professional is knowledge. Often, basic understanding of the tools and their use even eludes many talented artists in the 3d industry. Major studios have made it a point to keep their best techniques secret. When you think about it, this is foolish. These same studios complain that they can't find qualified talent. They've created their own problem! The truth is that there aren't any real secrets, just a lot of hard work. Have you noticed how 3D writers tend to make the tutorials seem very simple and straight forward? How often do you hear them mention 'tweaking' in an article? Probably never. You'd never guess that 3D animation is tricky, technical work that is founded on tweaking. Nothing, and I mean nothing, goes right the very first time. The studios aren't hiding anything other than the fact that they must work hard to make the wonderful creations that inspire us.

What the industry has been lacking, is a mechanism that presents users with a reliable source of quality educational information. Sure, there are plenty of magazines. The sad fact is that these serve the advertisers, not the readers. Let's face it - the average 3D magazine is 70% ads and only 30% content. Much of that 30% is features and news. You're lucky to get five pages of actual tutorials out of the average issue. This is just plain unacceptable! Why should people be expected to pay for something that is nothing more than a catalog? I'm not here to disparage 3D magazines, but it's high time something was done for your benefit.

That's what Serious 3D is all about. I know you've heard plenty of promises from companies in the 3D industry that turned out to be nothing more than marketing hype. Well, we don't plan to follow their lead. Instead, we are doing everything we can to ensure that we follow through on the wealth of promises we've made. The magazine you are now holding is evidence of that. We're taking a different approach. Rather than inundating you with a flood of ads, were packing each issue with more than 85% content! That's right - we limit ad space to a mere 15% of the magazine.

Further, we won't place a single advertisement in the middle of a tutorial. I'm sure you've had it with the annoying page flipping and searching to follow a tutorial as it weaves its way between the ads. Well, so have we! This magazine was created for you ... we're doing everything we can to ensure your satisfaction and ours.

Serious 3D is created and managed by artists who work in the industry creating 3D effects on a daily basis. Why is this important? Well, you'd be surprised to know that the staff and editors of the other 3D magazines often aren't actual 3D artists. This means they have no idea what your needs are. Do you want someone outside the industry telling you how to do 3D graphics? I certainly don't. How can they relate to us when they have never experienced the pain of searching for the answers? They can't. Rest assured - everyone here at Serious 3D is an accomplished 3D artists, even our sales people! We're sympathetic to your needs, because we've been there! This makes Serious 3D magazine the first reliable source of tutorials for 3D artists. We remember how hard it was to learn the 3D programs we use every day in the production of the magazine. The tutorials in Serious 3D explore the very questions you're asking in your own learning process.

Another major step we've taken to satisfy your need is to develop dedicated columns. How many times have you read a great tutorial in a magazine but it was for a program you don't use? Man that's annoying! The topic was great, but it did little for you since it featured a program you don't use. Our regular dedicated columns are specific to various 3D programs. Sure, we may not have them all covered in this issue. By the end of the year, though, we'll cover more than fourteen 3D products on a regular basis. In every issue you'll find a tutorial for the program you use. Also, each issue covers a feature topic (such as dinosaur modeling). Then, we show you how to create that feature topic in each of the programs we support! We use as many pages as needed to provide you with an intuitive and productive tutorial. We don't limit the length of our tutorials like most publications. Actually, we have a minimum requirement. Each tutorial is at least eight pages in length, and features around 30 figures.

Well, I've probably rambled on enough for this issue. To summarize, let me say that we will make every effort humanly possible to ensure that Serious 3D continues to evolve with your needs. We want this publication to be the best we can make it, and we'll need your help. Don't hesitate to provide us with your comments and feedback. We really are listening!

Warmly,

Bill Fleming

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Creature Design

Part One "The Model"

By Bill Fleming

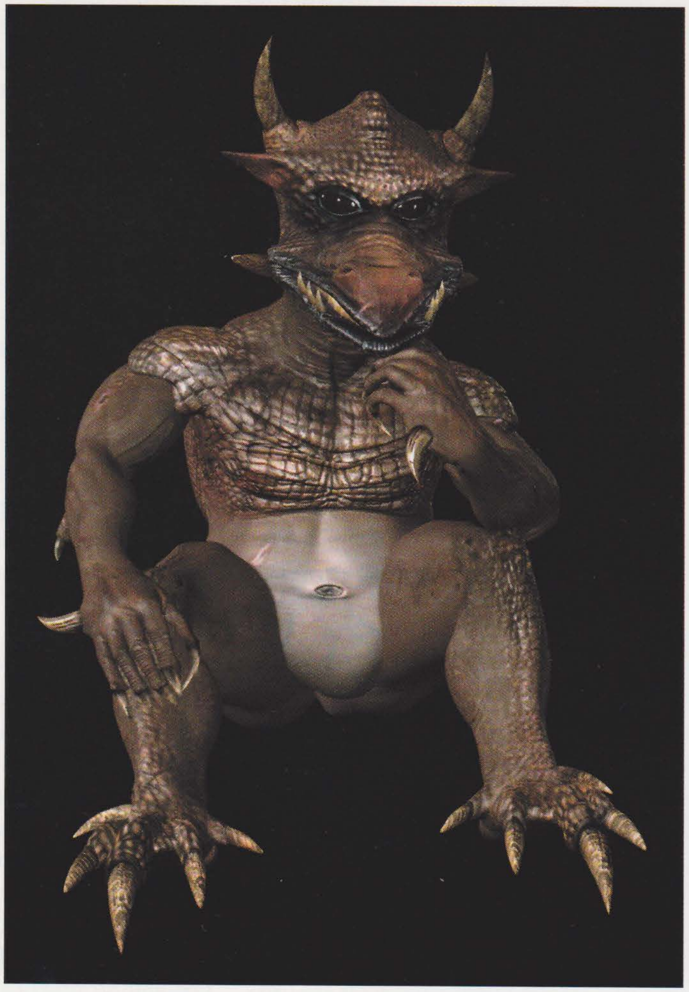

Figure 1.1 Chubbs the Strata Alien

Probably the most challenging aspect of 3D graphics is the art of creature design. Sure, the modeling and surfacing are complicated too, but it all starts with design. No amount of effort and skill at modeling and surfacing will compensate for a weak design. Of course, photorealistic creature design requires a great deal of research and observation. Mother Nature has kindly created a wealth of source material for us.

Many designers make the same mistake when creating fantasy creatures — they get hung up on the word 'fantasy.' The creature may not exist in reality, but it needs to appear that it could! The viewer has to believe that if evolution took a wild turn just such a creature might exist. Really, who knows what lurks in the deepest parts of the forests or jungles anyway? There could well be all kinds of crazy creatures we haven't discovered yet. Consider the mystery surrounding the Loch Ness monster, 'Bigfoot' and the 'Abominable Snowman.' Even the 'two-headed batboy' on the front page of the National Inquirer looks intriguing.

The point is that your fantasy creatures need to embody the elements of recognizable creatures to be convincingly realistic. Have you noticed how Hollywood tends to make its menacing creatures bipedal. This is because we're familiar with bipeds, comfortable with their appearance. Conversely, creatures with fifteen legs and three heads tend to be less believable. This doesn't mean that you can't create weird and even grotesque creatures that are convincing. It simply means that you can't skimp on research and planning if you want viewers to 'buy into' the character.

In this first part of Photorealistic Creature Design, we will be looking at the modeling design of creatures. In the second part (next issue) we'll discuss photorealistic surfacing for your creatures. Both matters are of equal importance. If either is done without preliminary regard to proper design, your creature will lose all credibility. In examining the process (of photorealistic creature design) we'll review actual examples showing how the technique is applied. OK, enough talk — let's get started!

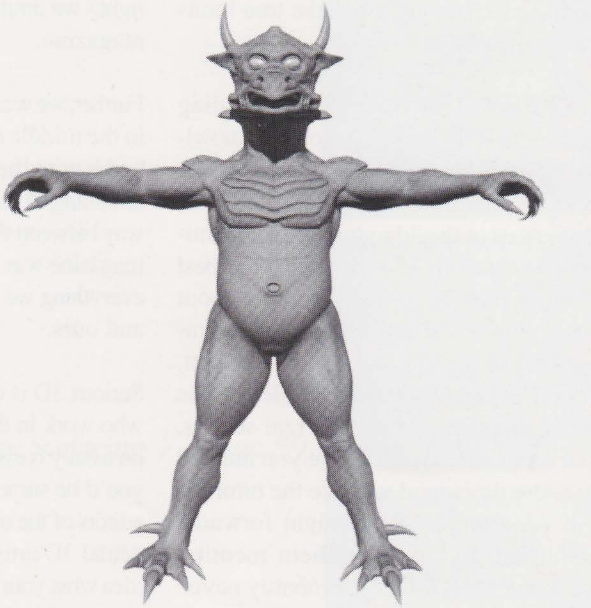

Figure 1.2 The naked front of Chubbs

Creature Biographies

The Foundation of Design

Nothing, and I mean nothing is more important that the creature biography. It tells you everything you need to know about the character to develop the proper design. No detail is too small to include in the biography. Here are the most important elements to include:

- Habitat (tropical, arid, aquatic, forest, mountain)
- Motion Mechanics (fly, swim, walk upright, crawl, slither, climb, jump)
- Diet (herbivore, carnivore, insectivore or omnivore)

- Predators
- Defenses (physical weapons or evasive skills)
- Intellect
- Temperament

Without a complete exploration of these factors you can't expect to properly design the creature. To gain a better understanding of each, let's take a look at a creature biography. We'll then examine how each element applies to the creature's actual design. We'll use one of my favorite creatures for this discussion, shown in Figure 1.1.

Here we see Chubbs, an alien that lives deep beneath the earth's crust. As you can see, he's a very realistic creature with plenty of personality. He's also quite believable, although he's a fantasy creature. Let's take a look at Chubb's biography so we can better understand his design.

Chubbs' Biography

Chubbs, who acquired his name for obvious reasons, is an inch tall alien. He lives thousands of feet beneath the earth's crust. He is the last in a long line of warriors bred for violence. When he was but a wee Chubby lad, he made a promise to his venerable, dying father. He vowed to strive to unite the last remnants of his vanishing race, and protect them from extinction. Maintaining his 'girlish' figure requires vast food stores, as you might surmise by his substantial physique. The problem is that his main food source (the nymph beetle) is also the primary food source of the Jartung Dogth.

The Jartung Dogth is a fiercely competitive, 6 legged, underground weasel. It would like nothing better than to see the end of Chubbs' family bloodline and to annihilate the last of the small Chubby tribe. Remember that Chubbs is only an inch tall — the Jartung Dogth is well over eight inches in length! You can see Chubbs has his work cut out for him. Good thing he's adorned with many horns for defense. These are augmented by heavy plating over his vital organs, to protect him from his predator's teeth and horns.

Although Chubbs can be fierce, he's also a very wise warrior, with considerable cunning. He's certainly not a mindless brute. Actually, he is often immersed in deep contemplation. Wouldn't you be, too, if the weight of your species survival were balanced on your shoulders? I should hope so.

When not heavily involved in his weighty responsibilities as provider and protector for his people, Chubbs can be found at play! He enjoys a unique version of chess, wherein two players astride an ornamented Raven's beak use diamonds as playing pieces. J.P. Morgan would roll over in his grave!

Struggling as he does much of the time deep within the earth's strata, nature has kindly provided Chubbs with camouflage. His body colors are earth tones: tan, reddish-brown, and rust, to allow him to blend into his environment. The best defense is to be unseen. Battles are wisely avoided when they are avoidable. Of course, Chubbs proudly bears the many battle scars, new and old, on his stout body. In summary, Chubbs is a dynamic character who exudes personality (and the occasional unexplained odor.)

There you have it ... a typical biography for a fantasy creature. It's not terribly long, but very insightful. It doesn't take a great deal of text to describe a creature, just attention to detail.

Let's take a close look at how the biography evolved into the model we see in Figures 1.2 and 1.3.

The Making of Chubbs

The first step in the design process is to determine the general appearance of the character. Will it be an animal or humanoid? In the case of Chubbs, we're looking at a character that is both animal and humanoid. In essence, we have a biped animal. 'Why,' you may ask? Well, since Chubbs is a warrior, we can assume that he's humanoid, since humans are the only warrior species. Too, we must consider the motion mechanics of the creature. As a warrior, he must be bipedal to have suitable flexibility and agility. A quadruped would work, but would be seriously limited in battle. It's the difference between being 'horse' or 'rider.'

OK, so he needs to be bipedal — but why an animal? Well, humans would find it difficult living in an environment where there is little air and a lot of heat. Being only an inch tall, Chubbs' need for air is very minimal. We'll get into his height shortly. For now, let's explore the 'animal' issue a bit deeper. Being so diminutive rules out being completely human, so we need to add a little 'animal' to this character. While there are plenty of aggressive animals, none of them fight for the sake of fighting. Typically, animals fight to protect territory, their families or in simple self-defense. On the other hand, humans will fight for the pure pleasure involved. So, what we have is a creature that is a hybrid of human and animal.

If our hero is an animal, which type is he? Well, to determine this we need to examine his intelligence. You see there just aren't that many intelligent animals. There are dolphins, but as they're considered peaceful they won't do. Besides, nobody will buy into a biped dolphin. Then there are chimpanzees, which are both intelligent and bipedal ... but they are usually viewed as fun loving creatures. Making them warriors would be too much of a stretch. Planet of the Apes was a cool movie but nobody took it seriously. Yes, 2001 a Space Odyssey did show the evolution of apes into a warring species, but they didn't exhibit enough intellectual cunning. Chubbs is a creature that plays intellectual strategy games so we need a real thinker. OK, so we seem to be stuck. Well, not completely ... one creature in the fantasy realm is considered both intelligent and a warrior — the dragon. Consider Draco (the dragon in Dragon Slayer). He was quite intelligent, and a fine warrior. Sure, the use of Sean Connery for the voice was a bit over the top, but you get the idea. A dragon works for this scenario since we can accept them as being bipedal.

Now let's consider the height issue. Why is he only an inch tall? The tendency is to make warriors tall and menacing, but it just doesn't work in this scenario. Realistically speaking, to live deep beneath the earth you must be small so you can burrow. In the real world there are no large creatures that burrow. Burrowing animals are usually small reptiles and rodents. Ah, now you're wondering why he isn't a reptile. Well, that's simple. Reptiles need natural sunlight for survival. They depend on it to create the calcium in their bones. Without the sun they'd have brittle bones that would eventually break (commonly known as metabolic bone disease). On the other hand, humans need little sun. Sure, we enjoy it, but it isn't necessary for our survival. Again, the habitat strongly dictates the design of the creature. Also, at a mere one inch tall, Chubbs can easily run through burrows made by the larger rodents and reptiles that dig near the surface.

All right, we now have a one inch tall biped dragon. This is a cool creature, but what are his features? There are three things we need to consider when determining the specific features: habitat, diet and predators. First, we need to look at his habitat again. Since Chubbs lives deep beneath the earth's crust, we can assume that he eats insects. There aren't any mammals that far down, and certainly nothing in the way of botany (photosynthesis being out of the question). Of course, there are also very few insects that venture that far down either. They tend to live off the plant life closer to the surface.

Keeping this in mind, we can assume that Chubbs will be a bit portly. Why? Food is scarce far beneath the earth's crust, forcing him to make frequent trips to the surface. When he does, he eats as much as he can, because he doesn't know when his next meal will come. This is common with many animals in the wild. They typically eat until engorged, then spend plenty of time relaxing while the food digests. It's a means of survival in the harsh wilderness. Animals are actually quite lean where there is plenty of food — they know there will be plenty of food available for their next meal! Now, I know what you're thinking: 'Cows are fat.' We breed them that way so the meat is tender though. We overstuff them. Wild cows, and buffalo, are actually quite lean. OK, so we can assume that Chubbs lives up to his name.

Chubbs is both a warrior and an insectivore. Thus we can assume he has claws for digging and foraging for food, as well as defending himself. The claws will be rather large and thick to endure intense battles and digging, as shown in Figure 1.4.

Speaking of battles, now we need to consider Chubbs' defenses against predators. He is constantly facing the Jartung Dogth (remember him — the fiercely competitive, 6 legged, underground weasel?) This is one menacing predator, so Chubbs needs to be well protected and armed. His defenses consist mainly of heavy plating over his vital organs and joints, primarily the chest, shoulders, elbows and knees, as shown in Figure 1.5.

He needs the plating over his joints to protect them since they are a weak spot. Another area where he needs protection is his spine, which is notoriously vulnerable on all creatures. To ward off potential attacks to the spine, Chubbs sports large horns on his back, as shown in Figure 1.6

You can see it would be rather hazardous to approach his spine. Not all of Chubbs horns are protective. Some are very useful weapons, such as the ones on the back of his elbows, sides and top of his head. He also has a very long and flexible middle toe. He uses it to literally gut his opponents, much the way a Raptor once did in the prehistoric

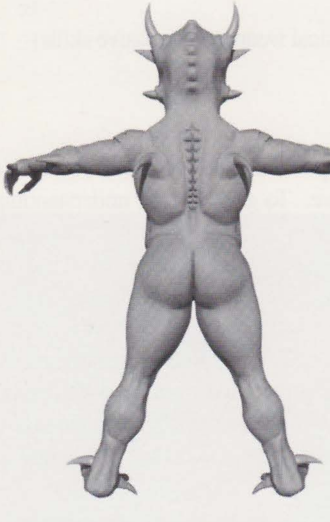

Figure 1.3 The naked back of Chubbs

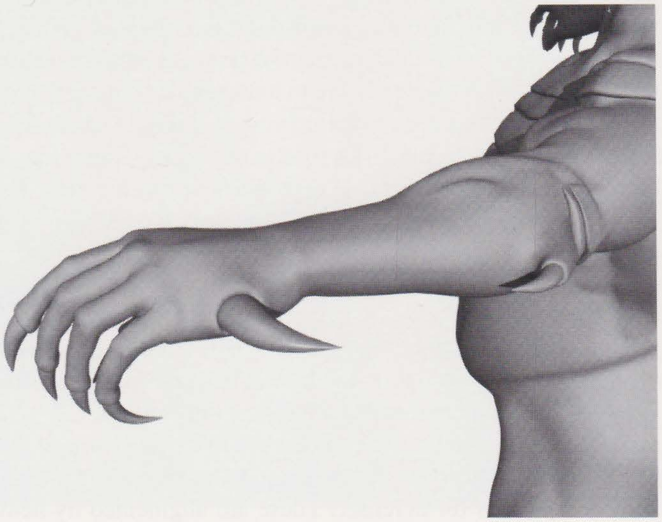

Figure 1.4 The formidable claws of Chubbs

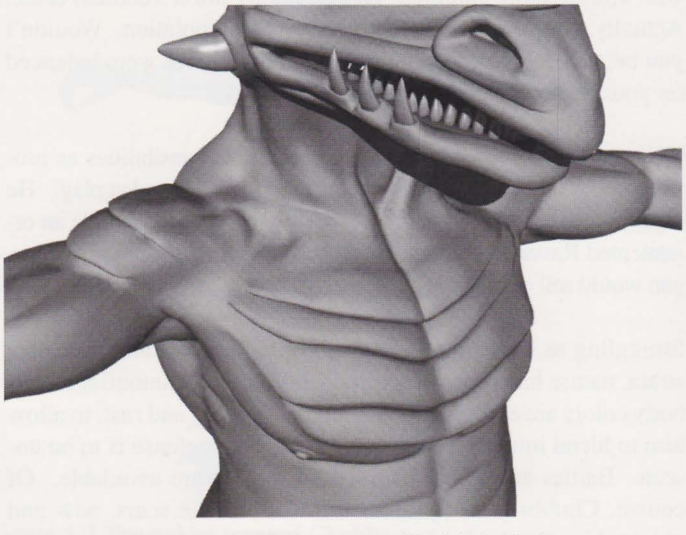

Figure 1.5 The heavy plating over Chubbs' vital organs

period. This same skill is common today among the Kiwi birds of New Zealand. Say, there's that dinosaur/bird connection again. Take a look at Figure 1.7, which shows this formidable toe.

That about does it for the general design of Chubbs. We managed to translate his habitat, motion mechanics, diet, predators, defenses, intellect and temperament into a believable model. Well, it's not quite believable yet. Let me explain:

It's the details that truly make a creature believable. How many creature models have you seen that were impressive, but seemed to be missing something. You may not have known what it was, but you knew it wasn't right. This happens because we are conditioned to expect certain things from creatures, or any object for that matter. We miss those small details that make the difference between a model that's 'cool,' and one that's outrageously photorealistic.

Let's take look at those details.

Getting Down to the Details

Details are the foundation of reality. Viewers expect them, even if they don't fully understand why. Think about it for a moment ... Have you seen models that looked great but weren't realistic? Sure you have. What was the problem? Well, they probably suffered from the 'smooth plague.' They were simply too smooth! No creature in reality is perfectly smooth. They are usually festooned with bumps, creased, bulges, divots and protrusions. They show evidence of fatty tissue, muscles, bones and tendons. Without these elements the creature won't appear realistic, no matter how well it's modeled. Take a look at any Hollywood creature and you'll see tons of detail. You'll probably even see too many, since they tend to overdue it a bit. You know, too much of a good thing...

People are funny about details. We'll fall for any creature that's highly detailed, no matter how ridiculous the design. Take H.C. Geiger's aliens for example. These creatures are about as far from realistic as you can get, but 'boy they look real!' 'Why,' you ask? Detail = reality. When we see that much detail, we just assume it has to be real — it's just too involved to be artificial. Therefore, if you want your own 3D creatures to appear realistic, you need to incorporate details. I'm not suggesting that you just start randomly dropping details on the model. The details need to be justified, based on the physiology of the creature. To better understand this principle, let's examine Chubbs' details.

One of the most important areas for detail is the head. That's the place we look first when viewing a character. The head is also the most detailed part of a character. We have the mouth, nose, eyes and ears to contend with, but that's not the end of it. There are details that support these areas. We can't simply add these details without adding the elements that support them: the tendons, muscle and skin, etc. Let's take a closer look at these elements on Chubbs (see figure 1.9).

Here are a number of details highlighted on Chubbs' head. Let's take a close look at each.

Horn Skin: This is an element too often left out on creature models.

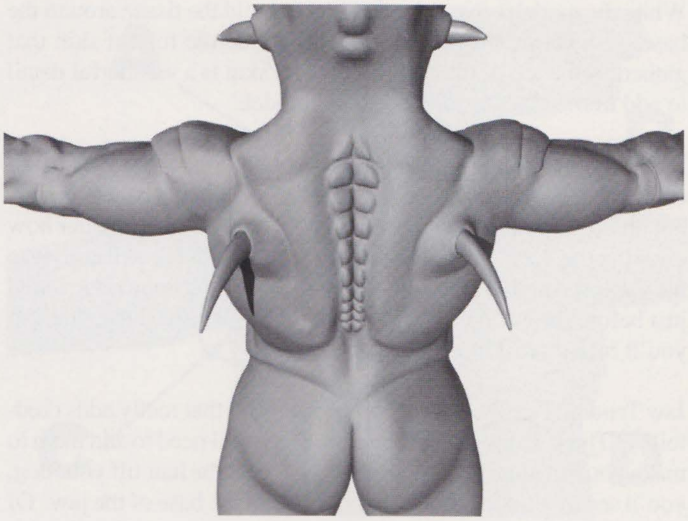

Figure 1.6 The horns that protect Chubbs' spine

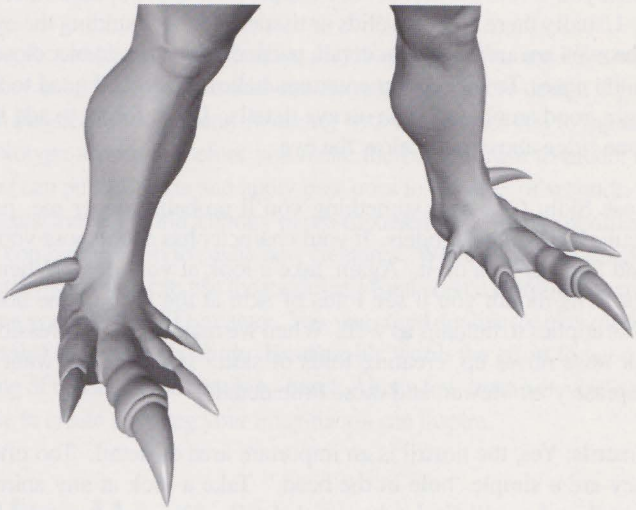

Figure 1.7 The "gut" claw

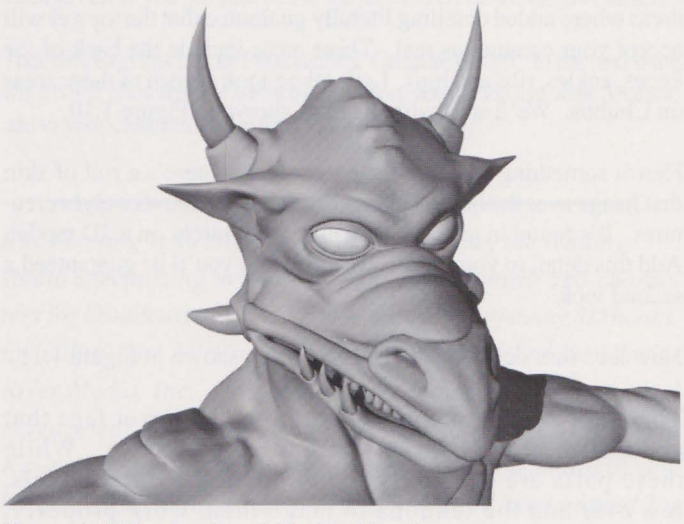

Figure 1.8 The details of Chubbs' head

While the modeler may take the time to build the tissue around the base of the horn, they rarely if ever include the fold of skin that gathers at the top of the horn base. This skin is a wonderful detail to add tremendous credibility to the model.

Ear: Boy, this is a very common problem area. The ears of all creatures are rather intricately detailed. This can be a pain to model, but oh-so necessary to create realism. It really doesn't matter how exacting the details are since any high level of detail will convince the viewer. Another element often neglected is the bony ridge found just before the ear. All creatures (including humans) have this, but you'll rarely see it in a 3D model.

Jaw Tendon: Here's another suite little detail that really adds credibility. The jaw is moved by tendons, so you'll need to add them to make your creature realistic. If you shave all the hair off your dog, you'll see several tendons clearly visible at the base of the jaw. Of course the dog will hate you, so just take my word for it. It's also a good idea to add some skin tissue folded at the corner of the mouth.

Eye: This is one of the real problems with most creatures. All too often you'll find the model has a simple hole with a sphere stuck in it. Usually there are no eyelids or tissue folds surrounding the eye. The eyes are areas of great detail, particularly at the corner closest to the nose. To make your creatures believable you'll need to focus a good amount of time on eye details. Don't forget to add the bone ridge above and below the eye.

Nose Skin: OK, here something you'll probably never see, particularly in human models. If your character has a long nose you'll find folds of skin on it. Again, take a look at your dog. When it opens its mouth you'll see folds of skin at the base of the nose. This applies to humans as well. When we make angry expressions our nose raises up, creating folds of skin. If you really want to impress your viewer, add these little details.

Nostrils: Yes, the nostril is an important area of detail. Too often they are a simple 'hole in the head.' Take a look at any animal nostril and you'll find substantial detail. They are typically an unusual shape, and go deep into the head. Also, it doesn't hurt to add some soft skin tissue around the nostrils on creatures.

Whew, that was a bit of work! As you can see, the head hosts many details, but it's not the only place! There are a couple of areas where added detailing literally guarantee that the viewer will accept your creature as real. These areas include the back of the knees, ankles, ribs and hips. Let's take a look at each of these areas on Chubbs. We'll start with the hips, shown in Figure 1.10.

Here's something you don't see too often. There's a roll of skin that hangs over the hips. This is very common in overweight creatures. It's found in nearly all creatures, but rarely on a 3D model. Add this detail to your portly creatures and you'll be guaranteed a second look.

Now let's turn our focus to the lower legs, shown in Figure 1.11.

There are two main areas of detail on the lower legs that are almost always forgotten: knees and ankles. While these parts are definitely found on all creature models, few ever add the tendons to make them work properly. Let's face it ... these parts aren't moving without

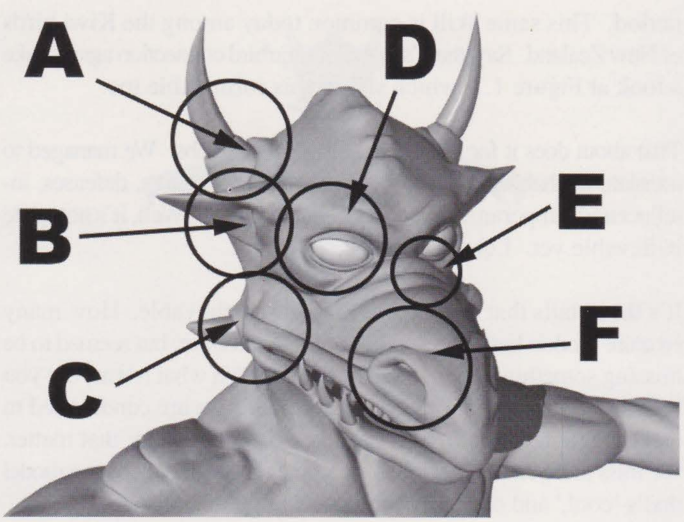

Figure 1.9 A closer examination of details

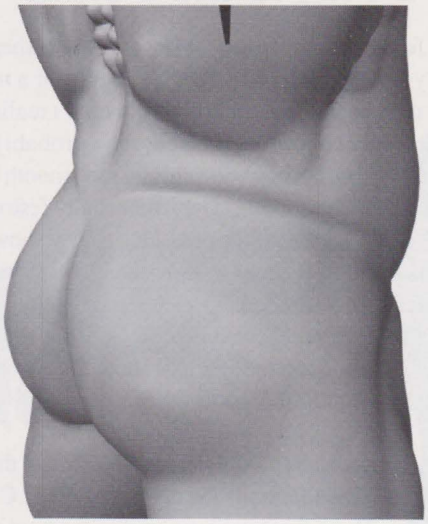

Figure 1.10 Chubbs hip detail

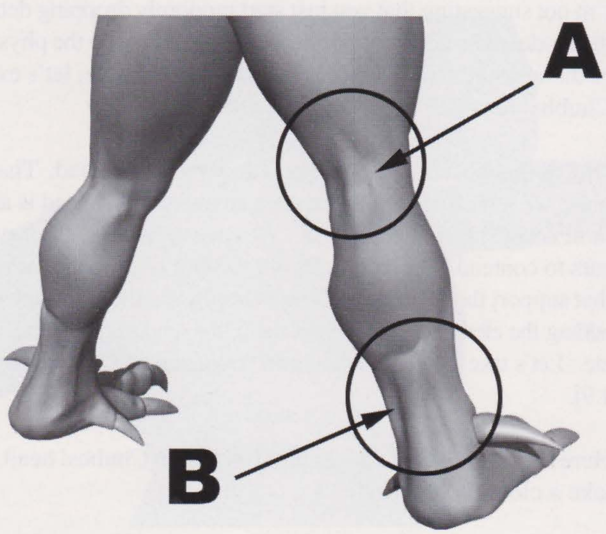

Figure 1.11 Lower leg details

tendons. Notice the tendons on the back of the knee shown in selection 'A.' Even in this simple shaded model they look very realistic. It's the little details that make the difference. Now take a look at the tendons on either side of the ankle in selection 'B.' Again, it's these little details that make the difference between a model that's great and one that's realistic.

Now let's take a look at the torso, shown in figure 1.12.

Here are a number of details highlighted on Chubbs' torso. Let's take a close look at each one.

Collarbone: Every animal has a collarbone, surrounded by a number of tendons and ligaments. To create a realistic creature, particularly for a humanoid, we need to incorporate this bone as a part of our surface detail. We also need to add some chaos with a few divots and bumps to represent the tendons at the outside base of the bone.

Neck Tendons: This is one of the coolest features. It will make your creature look either tough or wimpy, depending on how tight you make these tendons. Making them super tight, as shown in the figure, will project the appearance of power. If they were softened and smoothed out, the creature would appear more relaxed and calm. These are elements that need to be present, particularly if you plan to animate the model. They are instrumental in moving the head and lower jaw, so they will be constantly animated when the character moves and speaks.

Lower Shoulder Tendon: Ah, here's one of those pesky details that you'll rarely see, yet it really adds credibility to the model. The arm is controlled by a number of tendons. The ones on the upper shoulder are concealed by muscles, but the lower one is clearly visible on most humanoids. Adding this element will really drive home the photorealistic credibility of your creature.

Ribs: These are quite often featured in skinny creature models, but usually neglected on the chubbier ones. While the ribs on the chest are concealed in a portly creature, the ribs on the sides are quite often visible. It's a subtle detail, but adds yet another element of credibility to the model. Take a look at a rhino: you'll see the ribs at the point closest to the hips. The same applies for a horse or dog (shaved).

OK, that about does it for the details of the body. You can clearly see how these small elements really add to the credibility of the model. Sure, they are quite a bit of work, and realistically probably double the modeling time. Consider it the investment you need to make if you want your models to be realistic. The other option is to take the Hollywood approach, keeping the creature moving at all times, preferably in dimly lit environments to hide the flaws. Of course, where is the fun in that?

Put simply, creating photorealistic models is hard work. It doesn't happen overnight. You have to be committed to the details, and the research. I'm often asked what my recommendations are for training to become a creature modeler. I'd have to say that the best thing you can do is to study animals, insects and other creatures of the wild. Spend a few weekends in the library taking notes. Examine pictures of creatures. Compile a list of common features and attributes, based on their habitat, diet, predators, and other factors. Build your own database of creature information that you can draw upon when creating your 3D creatures.

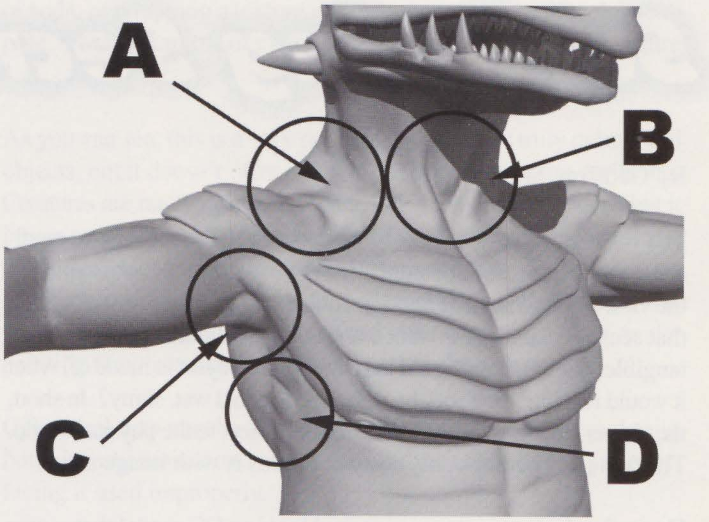

Figure 1.12 Torso details

You should also try your hand at clay sculpture. You see it's much easier to become familiar with the elements of creature design if you can physically mold them. Working with clay allows you to rapidly prototype a creature before you make the commitment to model it. You can pull off parts and apply new ones in a matter of seconds. I suggest that you build a library of pre-modeled parts, then experiment by combining them to create new creatures. When you reach a satisfactory look, you can use the model as visual source material for creating your ultimate 3D creature. Yes, you could digitize the clay model but that would be cheating. Besides, it's worth the effort to get the hang of modeling the details by hand. After a few creatures, you'll be able to create anything your imagination can inspire.

Wrap Up

As you can see, the thought behind the development of Chubbs was quite considerable. To make believable creatures you must invest a reasonable amount of effort in the details. You have to sit down and think the creature through before you put your pen to the paper to create the original sketch.

That wraps up this part of Photorealistic Creature design. In the next issue we'll cover photorealistic surfacing, and how you decide just what details to add to your creatures. Until then, keep on modeling!

Bill Fleming is President of Komodo Studio, the leading studio specializing in photorealistic 3D creatures and characters for broadcast and film. Bill is the author of many 3D books, including 'The 3D Creature Workshop,' published by Charles River Media, Inc. He's also a contributing editor for several magazines, including Animation World, Visual Magic and Keyframe. Besides being a 3D artist, Bill is a biologist and herpetologist, which has given him a solid background for photorealistic creature design.

Surfacing Secrets

Part One

By Geoffrey Smith

The virtue elevating a unique, 'drop your jaw' 3D image above mediocrity is often superb surfacing! The surfaces of any 3D object supply the viewer with vital information about everything that exists within that scene. Usually, we want everything we create to appear to be tangible. The viewer should know what the object is made of, what it would feel like. Is it soft, hard, fluffy, dry, cold wet, slimy? In short, the viewer should be able to relate the 3D object to the physical world. The best (and perhaps only) way to do this is with image maps.

How often have you seen a very cool looking CG model that seems slightly unfinished? Probably all too often! In most cases, this is because the surfacing seems unrealistic and/or intangible. Often the surface consists simply of a primary color that looks like some kind of smooth 'other-world' plastic. If there is any texture to the surface, it's probably a conspicuously tiled or clumpy pattern. Such is the nature of default 3D shaders. If you want to create stunning, photorealistic images, don't rely on the default shaders. They simply don't have the detail and 'chaos' required to pass for real world complex surfaces.

Most 3D applications - from Hash ($200) to Maya ($10,000) - allow us to place scanned or painted image maps onto the surfaces of their 3D objects. Using image maps, we can re-create the look of any surface in the real world.

Sounds great, right? How, though, do we go about making these image maps? To begin with, we need to understand just how the image maps are applied before we talk about creating them. Since you're probably already familiar with image mapping methods, we'll just review them briefly.

Image Mapping Methods

There only four basic methods of mapping images: planar, cubic, cylindrical and spherical. Every 3D application I've ever used contains at least these four. Each method provides a way to get our own imagery onto the surface of our latest 3D masterpiece. Often we'll use a combination of the mapping methods to get the exact look desired. These four basic mapping methods can suffice to bring our 3D characters, creatures, and objects magically to life. Let's take a look at how each one works.

The Planar Mapping Method

As the name implies, planar mapping is perfect for placing a flat image onto a flat surface. For instance, you have a model of a picture frame (with a plane inside the frame). You want to place a picture of your good buddy Joe within that picture frame. Planar image mapping is the answer (see Figure 1.1).

This example is of course an ideal situation. As we all know, ideal

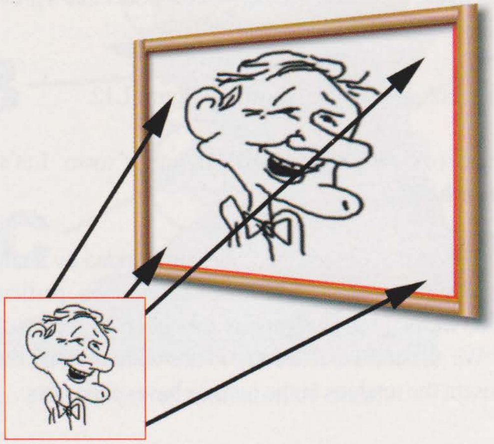

Figure 1.1 Planar Mapping to a Flat Plane

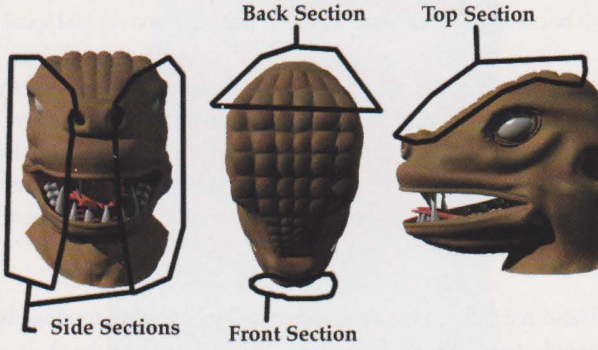

Figure 1.2 Planar Mapping an Organic Object

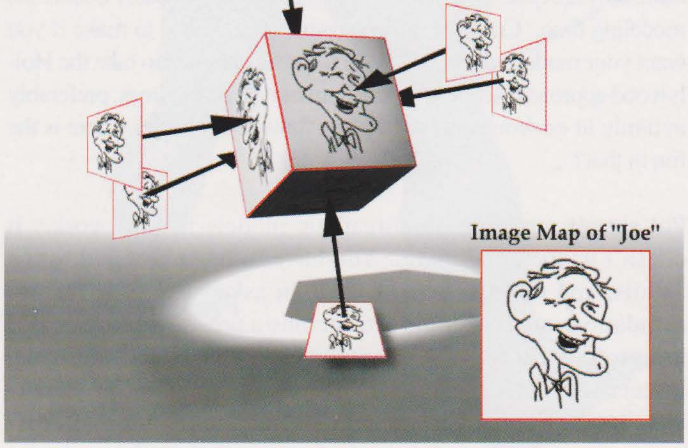

Figure 1.3 Cubic Mapping in Action

situations are few and far between. Planar mapping is also great for mapping organic surfaces. Why? Because planar mapping is one of the most straight forward of all of your options. When planar mapping, what you see is what you get. Imagine that we wanted to planar map the head of 3D human character. We'd need to first 'break' that head into 4 distinct sections: the front (i.e., the face), sides, top, and finally the back of the head (see Figure 1.2).

We then need to make sure that each section has a different color, so that we can tell where one ends and the other begins. Now we can render out the four views of our head model: a shot from the front, another from the side, a third from the top and finally the back. Using these images as templates will define the boundaries of our four image maps. Load the face into a paint program. Select a new layer, and begin painting in the colors for the skin, lips, pimples, etc. This method ensures that the lips that we paint on our image map match up exactly with the lips of our model. Perfect registration, of course, also requires us to carefully crop the image map to conform to the face area of our model.

Think of planar mapping as though you're projecting the image map from a slide projector onto the selected area (like the face) of the model. As long as both the image map and the selected area have the same proportions (the same ratio of height and width) you'll get an exact match up of the features of both image and model.

The drawback with planar image mapping on organic surfaces is that sometimes the image map may 'stretch' a bit, in areas like the nose and lips. This is because the sides of the nose are nearly perpendicular to the front of the face. The image map must stretch in such instances, just as it would when projecting an image from a slide projector onto a contoured surface. Later in this article we'll suggest several ways to combat this tricky little problem. Right now let's take a look at the other image mapping methods.

The Cubic Mapping Method

Most of the 3D program manuals describe cubic mapping as a great way to map a box or a cube. This is true, but cubic mapping is also a great way to map organic shapes. Let's look at how cubic mapping works. In Figure 1.3, cubic mapping the 2D image map of our buddy Joe projects his face onto each of the six sides of a cube.

This is a great way to create repeating details (like wrapping windows onto the sides of a skyscraper) but can it serve for mapping organic creatures? Well, many creatures have a basic skin texture that repeats over their entire body. For example, the pores in human skin are relatively consistent over the entire body. You could use a cubic map for the base skin texture, applying planar maps for the larger skin pores on the face, hands and joints. Cubic maps are great for laying the foundation of your creatures surfacing. This is a very powerful technique! Cubic mapping can save you a ton of time and a pail full of headaches. Now let's talk about how cylindrical mapping works.

The Cylindrical Mapping Method

This mapping scheme allows us to wrap our image map around an axis. It's very useful for things like applying a label to a model of a can of soda, or wrapping a texture map of wood around a 3D telephone pole. For an example of cylindrical mapping, take a look at Figure 1.4.

As you can see, this is a very practical solution for truly cylindrical objects, but it doesn't offer much in the way of creature surfacing. Creatures are rarely cylindrical. Sure, a leg may be a cylinder - but it has an irregular, bumpy shape that will tend to stretch the detail of a cylindrical map, making the surfacing appear artificial. To solve this problem, we need to fall back on those wonderful planar maps. We make surfaces for the front, back and sides of the legs, then render painting templates on which to create seamless surfaces.

Cylindrical map may be a quick solution to surfacing creature details, but it is truly limited and can undermine the credibility of your surfacing if used improperly.

The Spherical Mapping Method

The last mapping method to discuss here is spherical mapping. Again, as the name implies, this method is best suited to round objects. Use spherical mapping when you want to wrap an image map of laces on a baseball, or continents onto a planet. It's a lot like taking a big piece of paper and wrapping it around a beach ball, only without having to tuck in the edges at the top of the ball. Let's take a look at Figure 1.5 to get a better idea of how spherical mapping works.

Of course, there is the problem of pinching at the top of the surface. Unless you have a solid color at the top, you'll end up with a mess where the map details are compressed to fit the small footprint of the sphere top and bottom.

You can circumvent this problem by creating three surfaces on the object, one for the top, bottom and side. This way you can cylindrical map the sides and planar map the top. This will prevent the pinching very well, but you'll need to spend a bit of time tweaking the image maps so the details line up. To simplify your life, keep this in mind: a cylindrical or spherical map is roughly 320% the width of the sphere or cylinder. This will help you find the proper size for the cylindrical image map used on the side of the sphere.

Now that we've gotten the mapping methods out of the way, let's get on to the good stuff! We'll now take a look at what we can do with these mapping methods.

Surfacing Case Studies

We'll examine some case studies to find out just what makes a photorealistic 3D image. To begin with, take a look at Figure 1.6.

Here's a simple cheeseburger, on a plate with some fries. Looks 'good enough to eat' doesn't it? Everything in this scene, from the tabletop to the catsup bottle, is a surfaced and rendered 3D model. Now why, might you say, wouldn't we just photograph a real cheeseburger on a real table? After the photo shoot we could even munch out on the talent! For one thing, it's hard to readjust the scene after the set's been torn down. Also, after eight hours under photofloods a burger (even with lettuce and tomatoes) loses some appeal. Then too, there's the interaction with animated characters. If you require an animated character to eat the burger, you are a lot better off with a 3D hamburger than trying to composite a real one.

Further, with a 3D scene we can go back and change the lighting, change the pattern on the plate, or even change the texture of the sesame seeds on the bun. Best of all, the 3D burger needn't conform to the rules of our physical world. It can sprout eyes, a ten-gallon hat, and begin line dancing if we need it to.

3D graphics have become so visually sophisticated, that the line between reality and 3D has become seriously blurred. Just how can we take advantage of these sophisticated tools, transporting our 3D models into the world of photorealism? Mainly by using photorealistic surfacing.

One characteristic of photorealism is a huge variety of surfaces. If we were to simply apply colored Phong shaders to everything in the burger scene, we'd know what the scene was trying to convey would be hard pressed to believe in its reality. If we use sophisticated image maps and seamless surfacing techniques, the scene suddenly becomes photorealistic.

Photorealistic surfacing results from a combination of artistic skill and observation. It's knowing what the viewer expects to see, and thoroughly knowing the tools that we're working with.

Take another look at Figure 2.6. Notice the variety of surfaces in our cheeseburger scene. The bun looks soft and fresh, the cheese looks as if it's still melting, the fries look crisp and crunchy, and so on. These effects can only be achieved through painstaking surfacing. So, how was the bun seamlessly surfaced without showing image map stretching? Let's consider the bun top. The side of the bun top was cylindrical mapped while the top was planar mapped. The same technique was used for the bun bottom.

To surface the lettuce without showing stretching the model was created and surface in a flat position. Bones were used to deform the lettuce to conform to the shape of the burger. As you can see, sometimes it requires a creative solution to solve surfacing problems.

Now let's take another look at photorealistic surfacing. Check out Figure 1.7.

Once again we see a great deal of variety in the surfaces that contribute to this scene. From the leathery skin of the Sgt. Spore creature, to the plastic abutment on the mop handle, we think that this scene is real though we know it can't be. Often it's the little details of a 3D scene that fool the eye. Notice the attention paid to the surfacing of the Coca-Cola bottle cap and the slightly reflective wood-grain texture of the floor tiles. These things bring the reality of a scene home to the viewer, because they're sure they've seen these details before.

Now let's take a look at Figure 1.8. This scene offers up a wealth of surface information for the viewer.

Of course a scene like this relies heavily on an abundance of 3D geometry and a variety of shapes, but that's not why it's realistic. Check out the palm tree posts forming the fence ... each one slightly different! A common mistake is to use a single image map repeatedly.

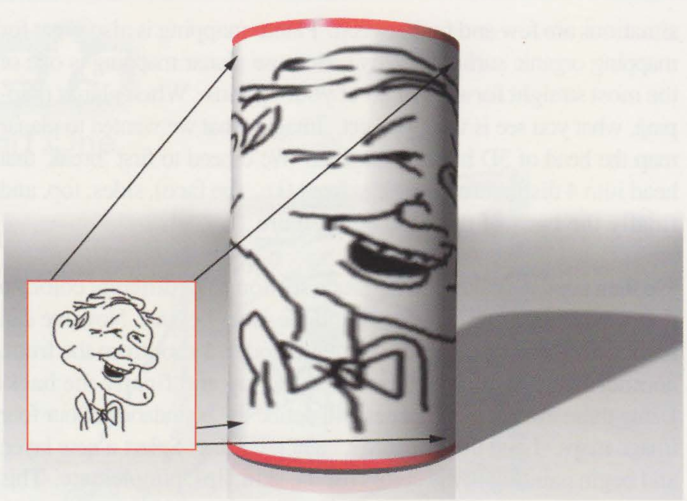

Figure 1.4 Cylindrical Mapping in Action

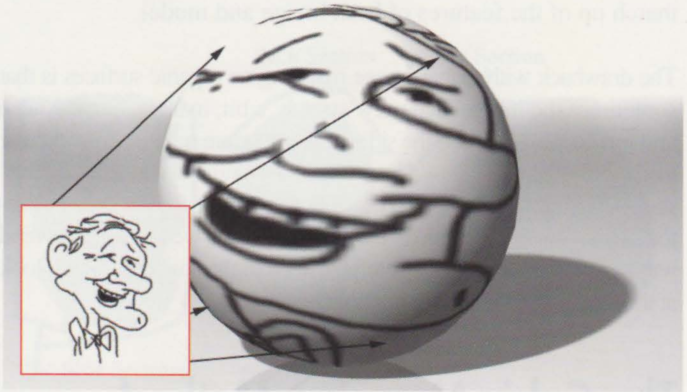

Figure 1.5 Spherical Mapping in Action

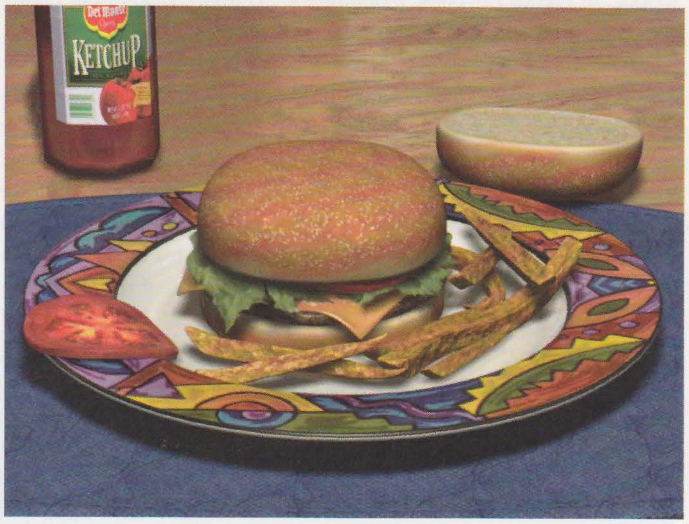

Figure 1.6 Burgers and Fries in 3D

Most 3D artists would create only one image map, cylindrical mapping it around first one post, then all the other posts too. This makes sense since it saves so much time, but it would really disrupt the believability of the scene. I doubt there are two identical fence posts in all the world. I'm not saying that we need to make a separate, unique surface for each of the fence posts - that would take forever, and really bog the machine down when it came time to render. All we need to do is put a slight rotation on each post and/or flip some of them. This will hide the fact that they are actually the same. This has been done in our jungle scene, and it really helps to convince the viewer of the scene's realism.

Notice that the color scheme used for this image is a very concise palette of dulled-down beiges, yellows, and browns, contrasted by the blue sky. It's not the type of color palette we usually see in a 3D image. Usually we see the oversaturated primary colors common to cartoons and package design. Primary colors are rarely found though in the real world. Imagine if the leaves on the palm trees in the scene were all primary greens. The reality of the entire scene would fall apart!

Let's take a closer look at the different types of texture maps that were used. There are four basic types of texture maps that all work in radically different ways when applied to our surfaces: color, bump, specularity and diffusion. We'll consider each of these image map types and the role they play.

Working with the Color Map

Color maps, as you might expect, contain all the color information for the model. Since color is so psychologically powerful, color maps get a lot of attention. One thing to avoid is adding any shading or shadows to them. Your 3D program will take care of that for you. Often, if you have an art background, there's a tendency to add all of those shading details when creating the color map. It can be difficult to think only in terms of color, mentally removing all the shading information.

It's generally a good idea to begin with a single, predominant surface color. This is a foundation for what follows, like laying down a base tone or undercoat when preparing a canvas for a work of art. Once this predominant color has been found, be sure to write down its RGB values. This will be the main color for all the color maps for each of the color sections that connect with it. This is a very easy way to avoid visible seams due to color difference.

We don't want to paint in the shades of color, like a shadow beneath a character's nose. It can be helpful, though, to enhance certain details like wrinkles, pores, creases, sharp folds and such in the color map. These small details, that are really the result of shadows too, sometimes need a little more help than just the bump map alone can provide. Do this only for shadow details so small that we wouldn't notice something odd when the camera or the lights move.

One advantage to adding these small details here is that when [illegible] move on to creating the bump map we can duplicate the color map, reusing those details without having to paint them again. This brings us to the next section: the bump map.

Working with Bump Maps

Bump maps are extraordinarily valuable when it comes to creating photo-real images. They are ideal for believable skin textures, wrinkles, pockmarks, scars, and many other small surface attributes. These would usually be too difficult or take too long to model. Although bump maps don't actually change the surface of the model, they make light react to your model's surface as if they did.

The principle behind bump maps is fairly simple: dark areas of the map equal low altitude and light areas equal high altitude. Black appears lowest, while light areas seem the highest.

We can save ourselves much time and trouble by simply duplicating our color map as the starting point for the bump map. When creating a bump map from a color map, you'll need to do more than convert it to a grayscale image. You'll also need to increase the contrast to bring out the bump details. If you don't, there won't be enough difference between the colors to create a visible bump. A good rule of thumb is to increase the contrast by about 35%. You might also need to nudge the brightness by 5 - 10%, to keep the image from being too dark.

Another image that gets it roots from the color map is the specularity map.

Adding Specularity

The specular map tells the surface which parts are shiny and which parts are dull. It's similar to a bump map, in that it's usually a grayscale image. The exception is that specularity maps, rather than reading light parts of the map as high, cause them to render as shiny. The dark areas of a specularity map are read as being dull.

Not all areas of any creature's skin respond to light uniformly. Even undersea creatures have parts of their skin that are more shiny or more dull than others (compare a fish's scales to its fins). Now, let's consider the human face. It's usually much more shiny around the forehead and nose area, because the skin is taught in these areas. They also produce more oil and sweat than say, the earlobe.

A fairly good rule of thumb, when deciding if a particular area is shiny, is to consider how hard that surface is. How tightly packed together are the molecules that compose that surface? Take, for instance, your own fingernail compared to the skin on the back of your hand. The skin is much softer, and rather dull (not much light gleans off the surface) but the fingernail is hard and therefore shiny.

To save time in creating a specularity map, start with a grayscale [illegible] of your color map. Then, use your paint tools to add or [illegible]ct specularity by lightening or darkening areas of the map.

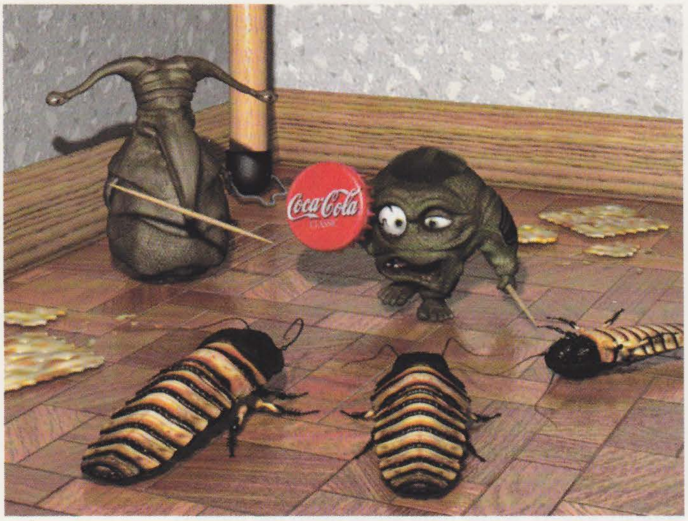

Figure 1.7 Sergeant Spore Battling the Madagascar Hissing Roaches

Let's take a look at the most important of all image maps when creating realistic creature skin - the diffusion map.

Now, let's consider the human face. It's usually much more shiny around the forehead and nose area, because the skin is taught in these areas. They also produce more oil and sweat than say, the earlobe.

A fairly good rule of thumb, when deciding if a particular area is shiny, is to consider how hard that surface is. How tightly packed together are the molecules that compose that surface? Take, for instance, your own fingernail compared to the skin on the back of your hand. The skin is much softer, and rather dull (not much light gleans off the surface) but the fingernail is hard and therefore shiny.

To save time in creating a specularity map, start with a grayscale version of your color map. Then, use your paint tools to add or subtract specularity by lightening or darkening areas of the map. Let's take a look at the most important of all image maps when creating realistic creature skin - the diffusion map.

Adding Diffusion

Why are diffusion maps the most misunderstood of all the map types? Well, for one thing, they are hard to define. Also, lacking a good definition of what they do, they are hard to experiment with because we're unsure of how they're supposed to work. Often, we'll take one of our previously made image maps, and try it out in the diffusion map channel. For instance, say you took your bump map and dropped it into the diffusion map channel. The result is that your creature becomes very dark. Hmmm, this is no good. So, most 3D artists ignore the diffusion map altogether, cranking the diffusion setting up to 100%. The result is that there is something noticeably 'not quite right' with the final render of the creature.

Typically, the surfaces become oversaturated by light, creating the typical hot spots you see on 3D creatures and humans. You've all seen it, the yellowish specularity of the skin. The yellow is present because it's the predominant color of human skin. When you use 100% diffusion and 100% value on lights, you are in effect multiplying the color of the skin - hence, the yellowish tint to the specularity.

Figure 1.8 The Jungle Scene

So what does a diffusion map do? The best way I've found to think of it is to consider it the final layer of your creature's surfacing - the layer light has to pass through before reaching the viewer's eye.

Are you totally confused now? OK, consider this: Light is the magical thing that gives any object its color. Light streams down at your creature, and hits the surface of its skin ... but not all the creature's color bounces back to the viewer. Why not? Because diffusion scatters the light across the skin's surface, limiting the amount of the surface color reflected to the viewer.

All objects in reality have diffusion. For example, a mirror has a 0% diffusion, which results in none of the mirror's color being sent back to the viewer - it's 100% reflective. Most metals have a diffusion of about 40%. They're reflective, but still show some of their own color. Something like flat wall paint has about 90% diffusion. Finally, skin, like that on our bodies, has about 75% than reading light parts of the map as high, cause them to render as shiny. The dark areas of a specularity map are read as being dull.

Not all areas of any creature's skin respond to light uniformly. Even undersea creatures have parts of their skin that are more shiny or more dull than others (compare a fish's scales to its fins). diffusion. When light hits human skin most of the color is reflected to the viewer, but 25% isn't. Never use 100% diffusion if you want to achieve photorealistic images!

Diffusion adds the richness to the surface. It's what makes the surface appear tangible, realistic. That's about it for diffusion mapping. Let's jump ahead to discuss an integral part of the surfacing process, creating test renders.

Test Renders and Tweaking

Being impulsive by nature, I tend to apply each new image map to the model right after I've created it. This allows immediate inspection of the image map. So, if the image map for the color of the front (even before applying any detail) is too dark, too light, too saturated we can fix it, getting it right before moving on. Also, this gives us an idea what the color map will look like before we get to the final render of the image. Another benefit of this technique is that it can push you into new directions that you may not have gone in if you were dealing strictly with the color map by itself. Each render serves as a sort of incubation period between revisions. By allowing the image to evolve in this way we can achieve a well thought out 'look' for our character.

With all of our maps painted and attached to the model's surface, we're ready to begin methodically scrutinizing how the maps interact with one another. This is a point that can be both rewarding and humiliating ... where we can see when the maps succeed and when they fail. It's crucial that we be objective at this point. Often, requesting someone else to lend a pair critical eyes can pay off at this stage.

With the model loaded into your 3D application, it's time to go over it with a fine tooth comb. Create close-ups and test renders of every conceivable view. It may help to render animations of the model doing 360 degree rotations. These animations needn't be very long (maybe three or four seconds each) but will give the best indication of how light plays across the bump and specularity mapped surfaces. Change the lights and camera angles around and re-render the animations, carefully studying the results.

Earlier, we mentioned the problem of image maps stretching. Bill Fleming, infamous creature creator, showed me a great way to troubleshoot a 3D model to guard against stretching.

How to Guard Against Image Map Stretching

Once the model has had its surfaces selected for mapping (we did that way back in the beginning of this chapter) it's a good idea to create a small, tileable image map as a 'surface tester.' This image can be as simple as a grid. What we map this little image onto each of our predefined areas of the model.

After this, some test renders will show whether we've got any stretching going on. Take a look at Figure 1.9, which shows the grid test map applied to Chubby, the portly dragon man. You can see the stretching areas indicated with circles. It's easy to spot problems, because you'll see where the grid lines are thick or where large gaps appear in the grid.

Image stretching is an absolute no-no in photo realistic images. If we do find some areas where it's occurring, all we need to do is go back into our modeling program and redefine the surface for mapping. Then, redo the stretching test to make sure you've removed all potential problems.

Unless you're part machine, you're bound to find problem areas in these stills and animations. There may be areas where the maps don't line up quite right, where the nose is too shiny, the bump maps are out of alignment, or where your maps are stretching. Tackle each problem area as it becomes evident to you. After all, this is the 'tweaking stage,' so tweak away!

At this point, most of the bull work has been done. In most cases, a problem exists only in a relatively small portion of the image map.

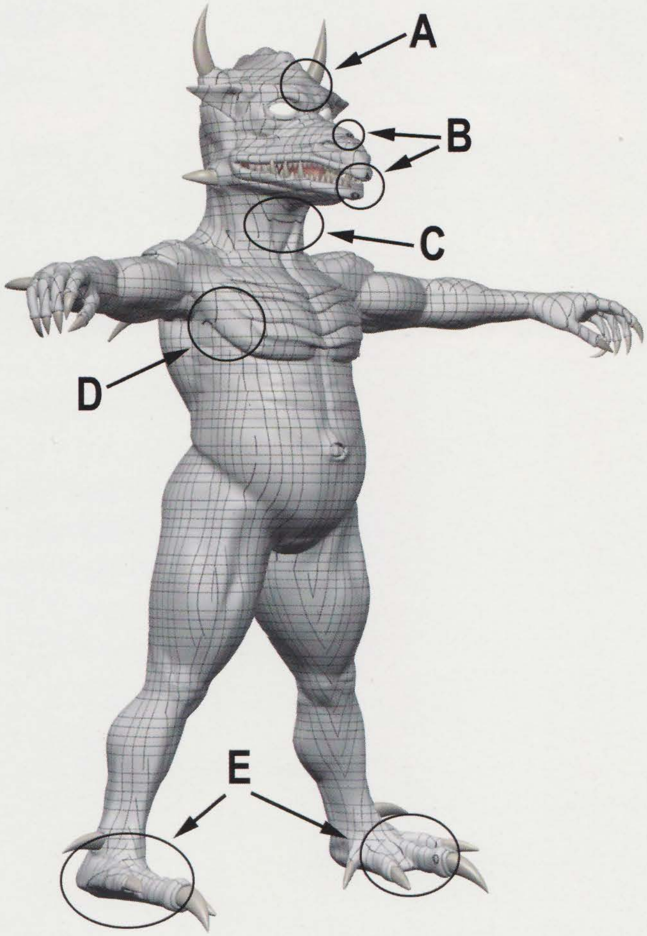

Figure 1.9 Using a test grid to identify stretching areas

Open up the image map where the problem exists - fix it, and re-render the results until you're completely satisfied.

It may seem like a long road to creating photorealistic image maps for a believable 3D character - it really is. In the end though, the results will more than compensate you for your labors!

Wrap Up

That does it for this segment of 'Inside the Secrets of Surfacing.' Next time we'll be exploring the rules of Photorealistic surfacing. Yes, there are rules, and they'll make your life a great deal easier. I'll see you next time!

Geoff is the lead artist and President of PixlSmith Productions in San Francisco, California, specializes in the creation of photorealistic surfacing for 3D creatures and objects. He graduated from the State University College at Buffalo, NY with a bachelors degree in the Fine Arts. He later returned to school to study computer graphics and animation at the University of Toronto in Canada. Geoff is an expert user of Photoshop, LightWave and Animation Master, he is also a contributing author of "3D Creature Workshop" published by Charles River Inc.

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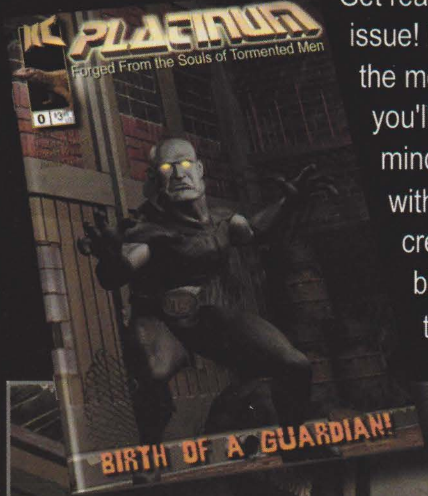

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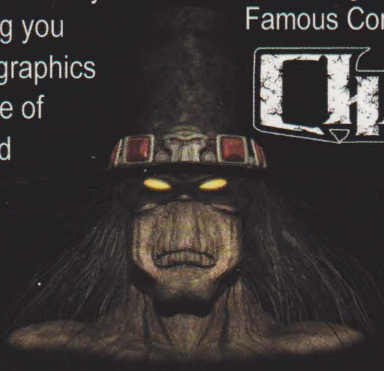

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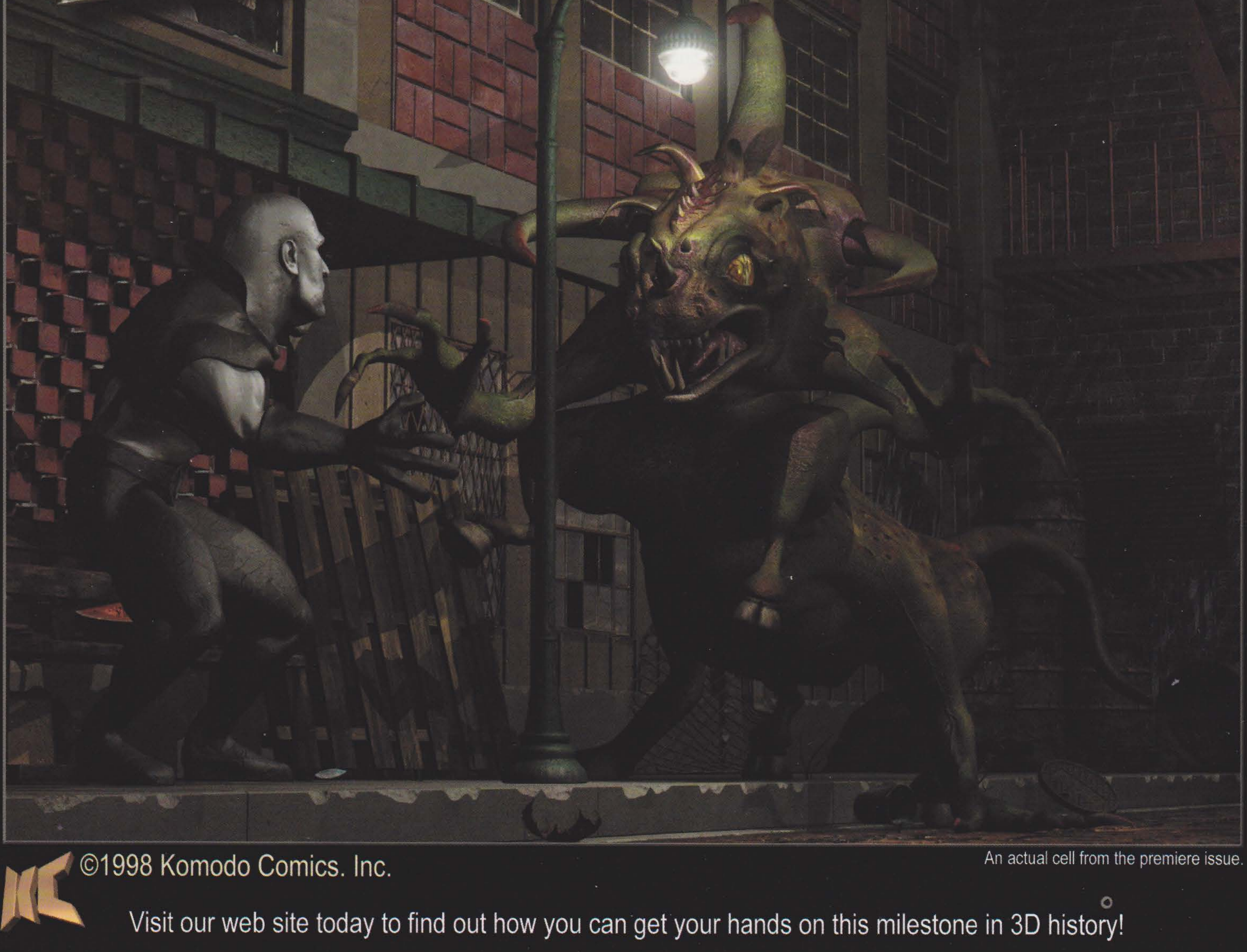

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LightWave

Prehistoric Creature Modeling

By Bill Fleming

In this tutorial, we'll be modeling a prehistoric creature with LightWave 5.5. You can still perform the tutorial if you have version 5.0, but lacking access to the Knife tool you'll need to be a bit creative. You'll need to manually add points to the polygons and split them. It's a bit more work, but not all that bad.

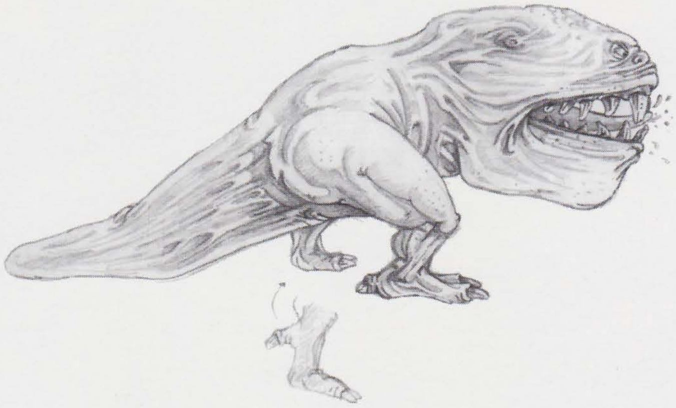

Figure 1.1 Artist's conception of the Craniosaurus

Since we're limited in space in this issue we'll move along fairly quickly. We'll restrict our exercise to modeling the main body. Don't worry, there are plenty of images to guide you along the way, and a model in the support file in case you get lost. I'll provide the completed leg of the creature, so you can attach it to the body later in this tutorial.

We'll be taking a unique approach to creature modeling. I call it the 'flat' method. We'll create a flat mesh of polygons against a template image. It requires a bit of getting used to, but it's the best method for creating detailed creatures. Why? The flat method allows us to add mesh detail wherever it's needed. You'll find that adding mesh detail after you've started modeling can be quite cumbersome and annoying. The flat mesh method simplifies this process, allowing you to plan out your mesh detail before you start tweaking the model.

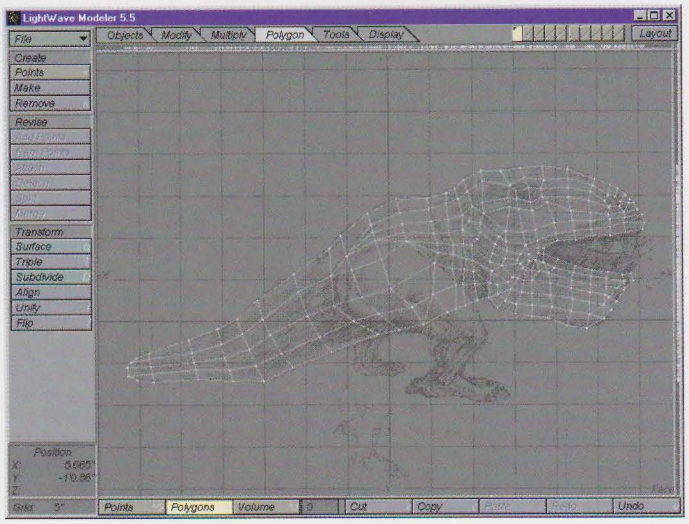
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Figure 1.2 The basic flat mesh

Before we begin modeling our creature we'll need to examine its biography. You can't properly model a creature until you've 'walked in its shoes.' Let's take a close look at the prehistoric creature we're about to model.

The Creature Biography

We going to model a fictional Craniosaurus, a 'Goblin Carnosaur' that roamed the earth during the Cretaceous period (about 100 million years ago). Yes, you read it correctly: I said 'Goblin.' Goblin mythology places their origin at about 65 million years ago, which was the beginning of the end for the dinosaurs. The Goblin dinosaurs preceded the Goblins by about 40 million years. Our Craniosaurus is shown in Figure 1.1.

Meat eating (carnivorous) dinosaurs with large, powerful heads were classified as Carnosaurs. Our Craniosaurus is a direct descendant of the great tyran-

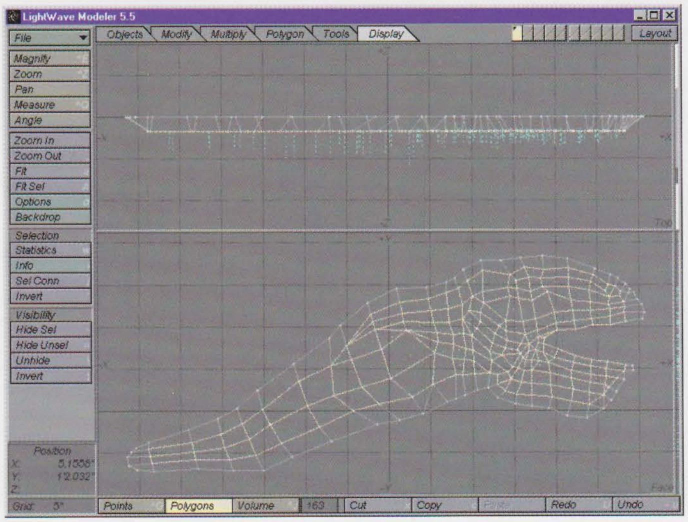
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Figure 1.3 Adding depth to the body

nosaur. Like the T-rex, the Craniosaurus was a Theropod, meaning it supported its weight on powerful hind legs. Not all Theropods were large, but they were all bipedal. Ours was one of the smaller Theropods, measuring only 15 centimeters in length. He also had only stubs where his forelimbs once were. Since the forelimbs of a Theropod were essentially useless, they were lost during the evolution of the Theropod.

Another feature of the Theropod was a long tail, which was used to balance the mass of their heads. Our Craniosaurus sports a long, thick tail too. While most of the Theropods were carnivores, many of the smaller ones like the Craniosaurus were insectivores. Due to their small size, they were unable to catch and subdue larger mammals. They fed on smaller ones, which could easily be grasped in their jaws.

The teeth on the Craniosaurus were much different that the typical Theropod, since its main diet was insects. You wouldn't believe the size of roaches back then! Anyway, they typically had the thicker, more rounded teeth needed to crack open the tough exoskeletons of insects like beetles and dragonflies. The jaw is hinged so it can move slightly to the side, allowing the Craniosaurus to swallow large insects.

The skull of the Craniosaurus is thin and light, enclosing large spaces in sides of the face. This combination enables the skull to be light and maneuverable, as very flexible too. The sinus cavity is rather large, enabling the creature to smell prey at a great distance. Beetles tend to emit a very distinct odor, and the Craniosaurus can detect it from as much as 300 meters.

The Craniosaurus was relatively small because of the evolution of the environment. As the world evolved into the Cretaceous period, the climate began to cool. The reduce amount of vegetation caused the number of larger herbivores to diminish dramatically. Since Theropods fed mainly on large herbivores, they needed to evolve for survival. They had to reduce their need for food, equating to a marked reduction in body mass. They also needed to change their diet to something readily available. The vast amount of protein needed to support their muscle mass was available from the insect world.

The Craniosaurus has a low profile. Its powerful legs enable it to reach speeds of up to 35 m.p.h.. While larger Theropods use their speed to increase the impact of their assault on prey, the smaller Craniosaurus uses its speed to evade predators. Enemies often included other Theropods, such as the Baryonyx, a bizarre Theropod discovered in Britain in 1983. The low profile of the

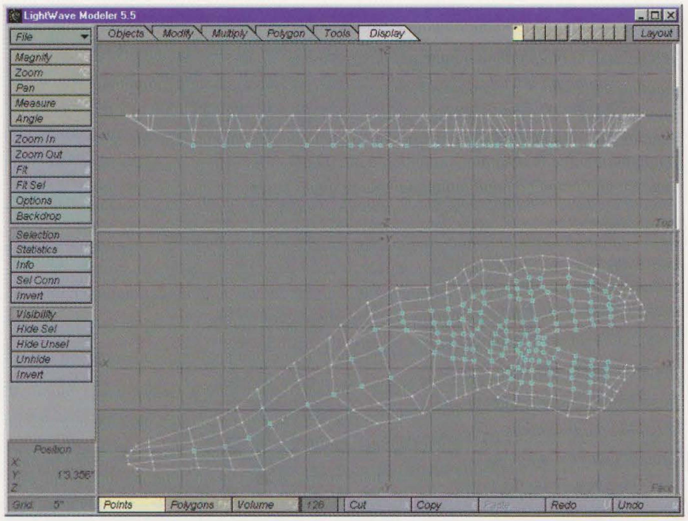
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Figure 1.4 Adding more depth

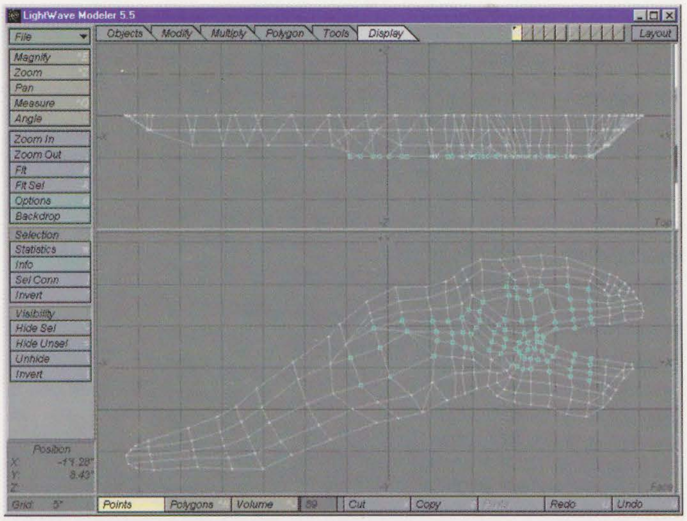
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Figure 1.5 Making the body thicker

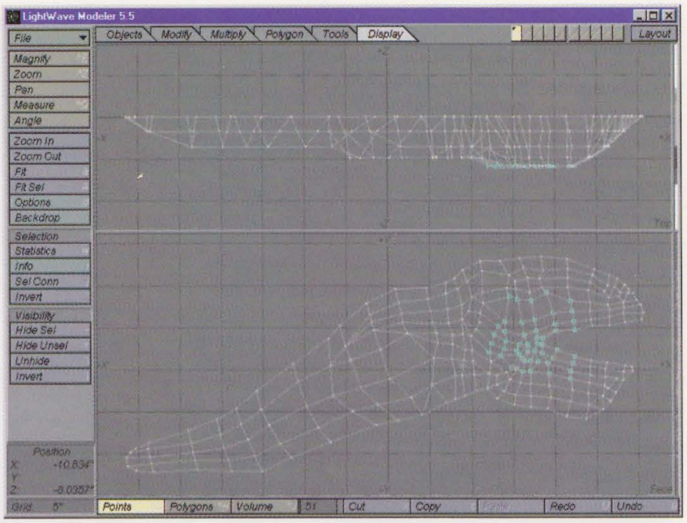
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Figure 1.6 Completing the head depth

Craniosaurus made it easy to eat insects, typically resident at ground level. It also made it much easier to navigate the dense forest when being chased. The Craniosaurus could easily run under fallen trees, disappearing into the underbrush.

Well, that about does it for our creature biography. Now that we understand the Craniosaurus, we're ready to start modeling it. We'll begin by setting up our template.

Modeling the Craniosaurus

The first step is to import the artist's concept sketch into the Modeler. This would be a good time to grab the support files off the Serious 3D support site, located at www.serious3d.com. Download the maylw.zip file under the May folder. This file contains support models, surfaces and color versions of the figures found in this tutorial.

Once the files are extracted, load Modeler and import the dino.iff file as the background image for the Z axis. This will be our modeling template. Now for the tricky stuff! The goal is to create a basic mesh over the template image that includes the details we'll need for the major features. This usually takes some experimentation to get it just right. You should have something like the mesh in Figure 1.2 when you are finished.

You should make an effort to use always quad polygons. There will be spots where you'll need to use triple polygons, but keep them to a minimum. We will be using Metaform to shape the mesh, and quads always work best when translating Adjoining Angles. Remember, never use anything more than 4 point polygons, or the Metaform function won't work properly. While you can Metaform polygons greater than 4 points, the result may be rather sloppy. To make things easier, you can load the template.lwo object that was included in the support files. This is the basic mesh shown in Figure 1.2. The next step is to give this mesh some depth.

This is where the bulk of the body starts to take shape. The first thing we need to do is remove the background template image. Caution: Don't clear the image, but rather set it to 'none.' We'll need to use the template image later when we create the legs. Once you've cleared the template switch to polygon mode, and select the polygons indicated in Figure 1.3. Drag them forward slightly.

Now we are starting to see the body take shape. The best part about this method is that it will form the bone ridge along the spine and jaw automatically. It's a real timesaver! Now we need to switch to point mode. Then, select the points shown in Figure 1.4, and drag them forward, as we did previously.

We now have the depth for the tail complete, but we need

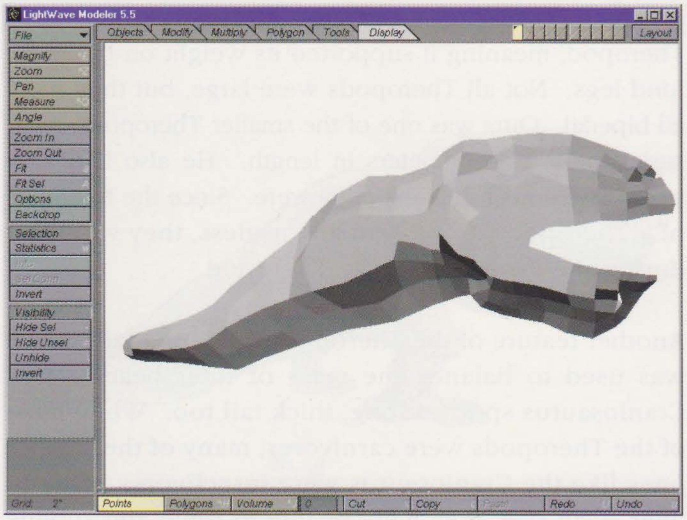
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Figure 1.7 A sold view of the body

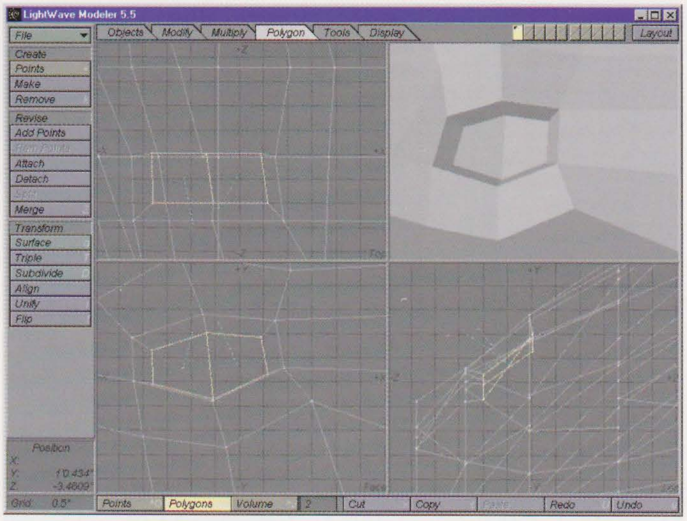
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Figure 1.8 Creating the ear

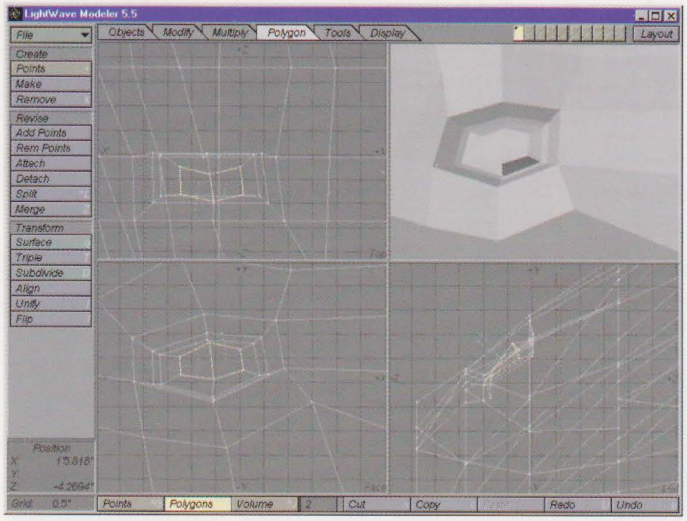
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Figure 1.9 The completed ear

to make the body thicker. Select the points shown in Figure 1.5 and drag them forward, even farther that the last time.

Great! We're really starting to see it take shape. The only body part needing more depth is the head. We need to pull the jaw line farther out. Select the points shown in Figure 1.6 and pull them forward as shown in the image.

As you can see, in only a few steps we have manages to model nearly all the body depth and details! You should now have something in your solid view that's similar to Figure 1.7.

All we need to do is tweak some points and polygons to finish the body and head. We'll take each detail one at a time to make it easier to follow. Let's start with the ear.

Adding the Details

Adding the details is rather simple. We'll be using Smooth Shift a great deal to add the polygons we need. We will always use an Offset value of '0' when we Smooth Shift. If we use a greater value, we stand a good chance of encountering errors.

The first detail we'll create is the hole for the ears. Reptiles have a unique ear. It's basically just a hole with a thin layer of skin over it. This membrane vibrates to pass sound waves into the skull. Let's ad the ear to our Craniosaurus.

Select the polygons shown in Figure 1.8, and Smooth Shift them with an Offset of '0.' Then scale them slightly, and move them into the head a bit as shown in the image.

To finish the ear, you need to perform two additional Smooth Shift operations. Scale the first, and move it back a bit more into the head. Then, scale the second a bit more, and move it forward to create a bump in the middle of the ear as shown in Figure 1.9.

It's looking good. Now let's move on to the eye.

Modeling the Eyes

What we need to do is create a hole for the eye socket, then create the eyelids. First, select the polygons in the center of the eye. Smooth Shift, and scale them down slightly. Finally, move them back as shown in Figure 1.10.

Now we need to move the back points of the eye forward, so the eye socket tapers towards the front. Select the two sets of points shown in Figure 1.11 and move them forward, until they match the image.

Before we complete the eye, let's outline it a bit better by creating the bony ridge over the eye. Select the four polygons over the eye. Smooth shift, scale, and move them

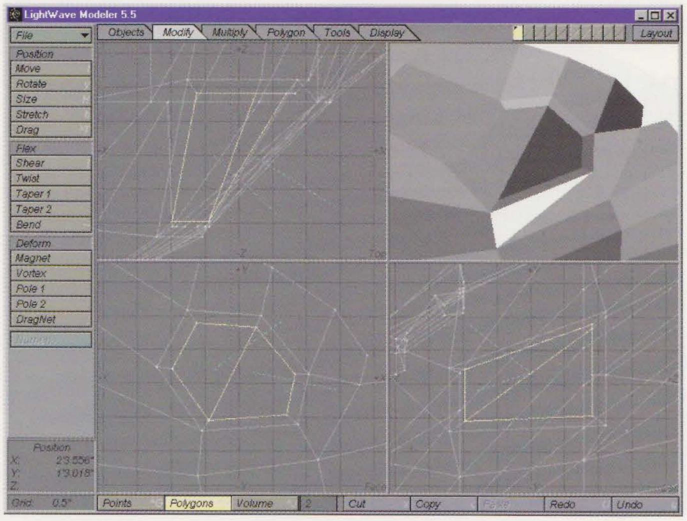
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Figure 1.10 Shaping the eye socket

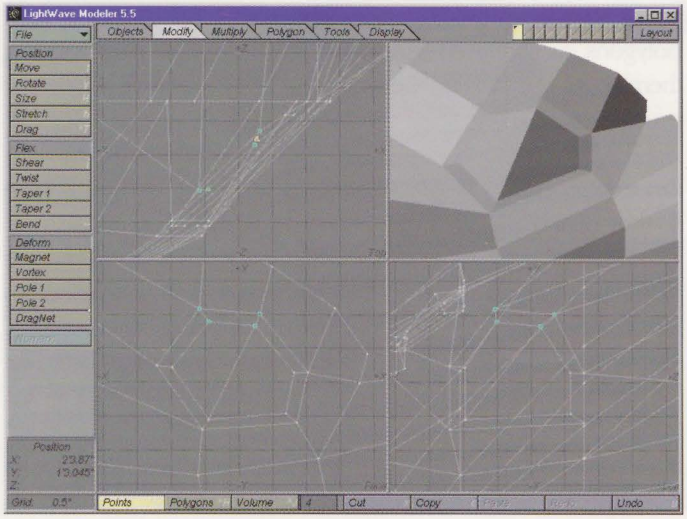
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Figure 1.11 Strengthening the back of the eye socket

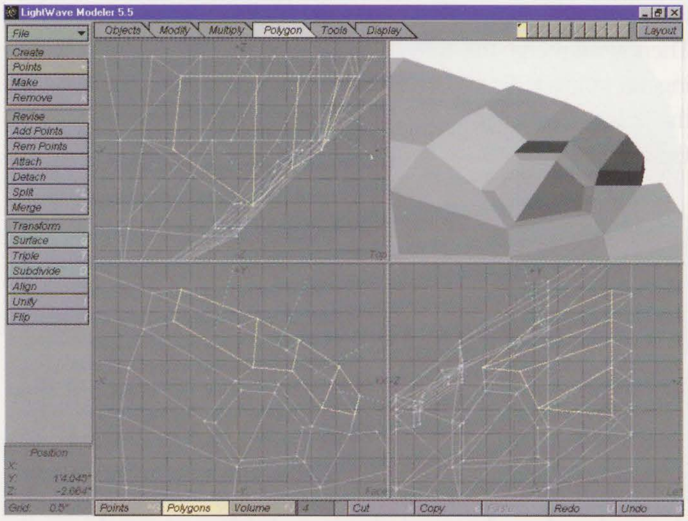
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Figure 1.12 Creating the bony ridge over the eye.

up and forward a bit, as shown in figure 1.12.

This is a bit exaggerated, so we need to tweak the points at the back and sides of the ridge to taper the bump. We want it to be prominent in the front but not in the back. Select the points around the base of the ridge in back and drag them to the positions you see in Figure 1.13.

OK, now select the two polygons in the middle of the eye. Smooth Shift them back into the skull to create the socket. Now we have to shape the socket for the eye. To do this, we need to create a template sphere. Click on the second layer, and select the first layer as the background. Now create a sphere slightly larger than the socket, as shown in Figure 1.14. Be sure to give the eyeball a new surface — name it 'eye,' and make it white so it's easy to distinguish from the head.

We need to do some serious tweaking to make the eye socket conform to the eye's shape. We also need to add the eyelids. This is a tricky step, so I've included the model in the support files (eyesocket.lwo) with this step completed so you can see how it was accomplished. What you need to do is select the top three polygons, as shown in Figure 1.15. Smooth Shift them, scaling them down and moving them forward a bit to extend beyond the eyeball.

Once the polygons are Smooth Shifted, you'll need to tweak them so they conform to the eyeball. Then you'll need to perform the same steps to create the lower eyelid. Here's a tip: you'll need to select the points at the corners of the eye socket, and pull them inward, too, so the eyelids conform to the shape of the eyeball. When finished, you should have something similar to Figure 1.16.

Remember, if you have trouble with the eye you can simply load the eyesocket.lwo file included in the support files so you can continue the tutorial. You can always come back and experiment with the eye socket.

Next we need to add some mass behind the eye. We'll do this by Smooth Shifting the three large polygons behind the eye as shown in Figure 1.17.

Then, we'll merge this mass with the ridge over the eye by welding the points indicated in Figure 1.17. Finally, we need to delete the polygons along the points we welded, which are indicated in Figure 1.18.

OK, that does it for the eye. Let's move on to the nose.

Modeling the Nose

The nose is a little complicated, since we need to add some skin folds around it. Lets start by selecting the two polygons of the nose and Smooth Shifting them forward as shown in Figure 1.19.

Now, select the polygons that run around the nose, and smooth

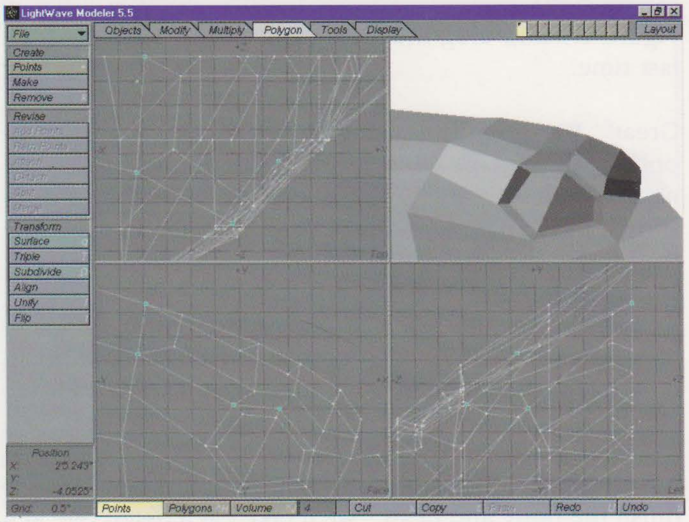
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Figure 1.13 Tapering the back of the ridge

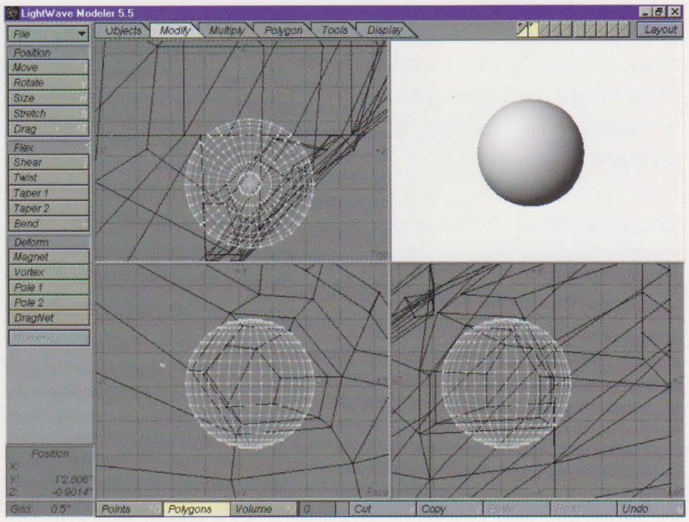
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Figure 1.14 Creating the eyeball

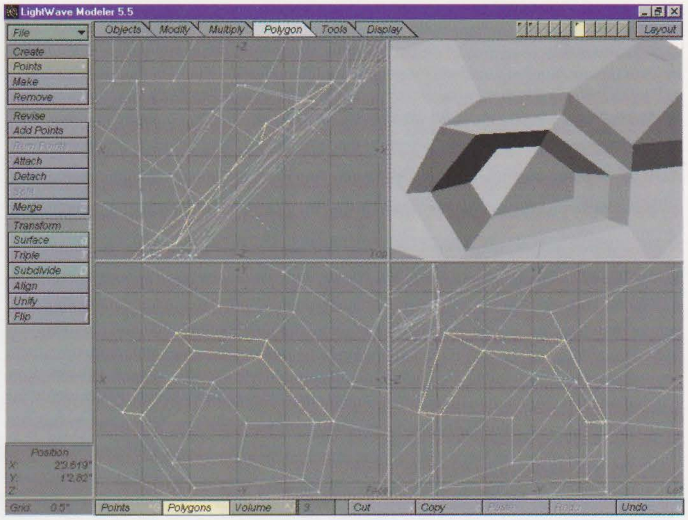
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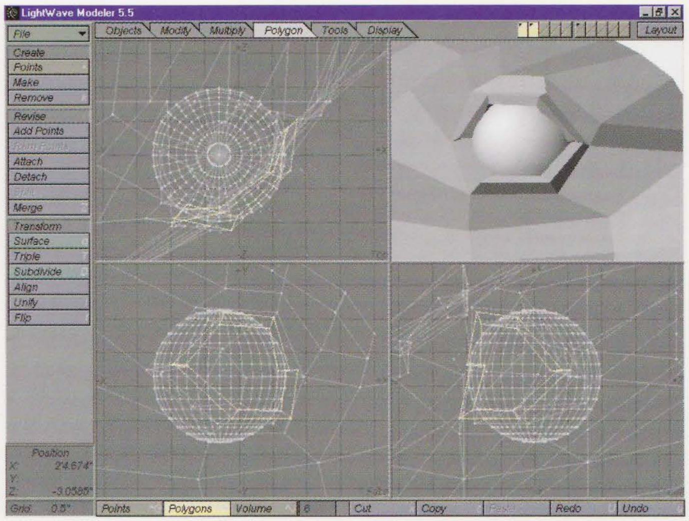
Figure 1.15 Selecting the polygons for the eyelids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Points
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Cut
Copy
Redo
Undo

Figure 1.16 The completed eyelids

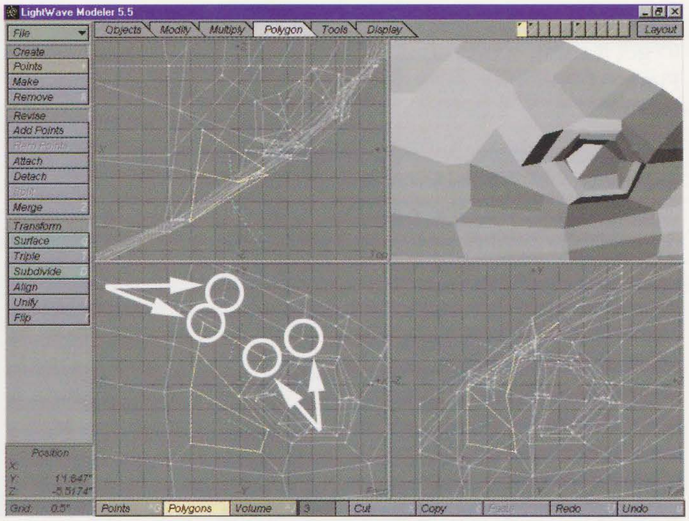
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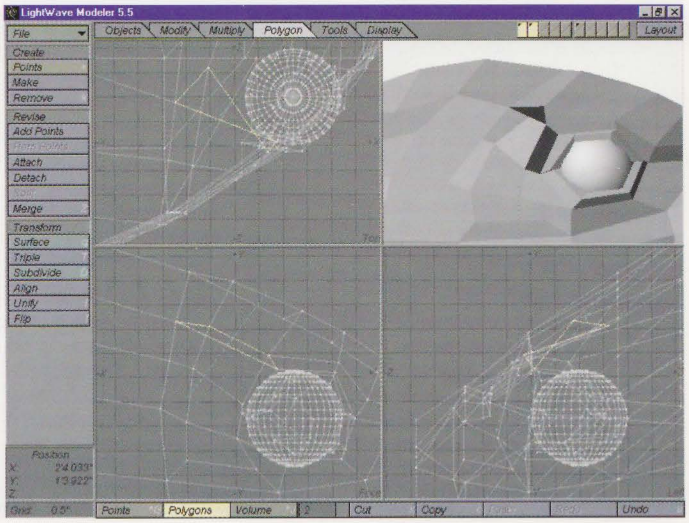
Figure 1.17 Adding bulk behind the eye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Volume
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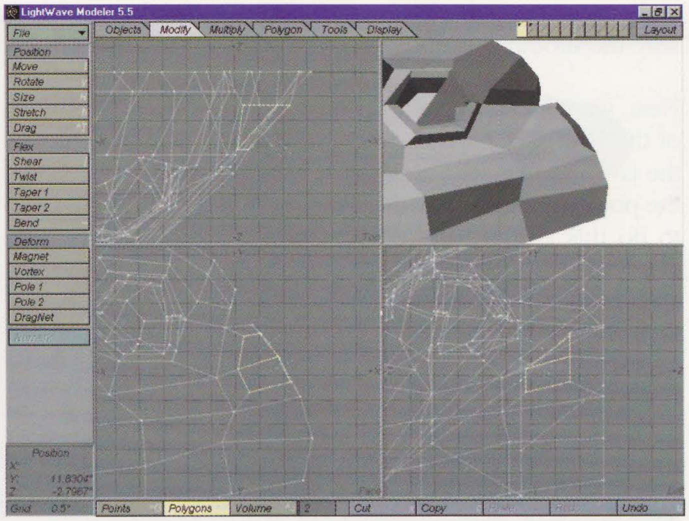
Figure 1.18 Deleting the excess polygons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Taper 2
Bend
Deform
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Vortex
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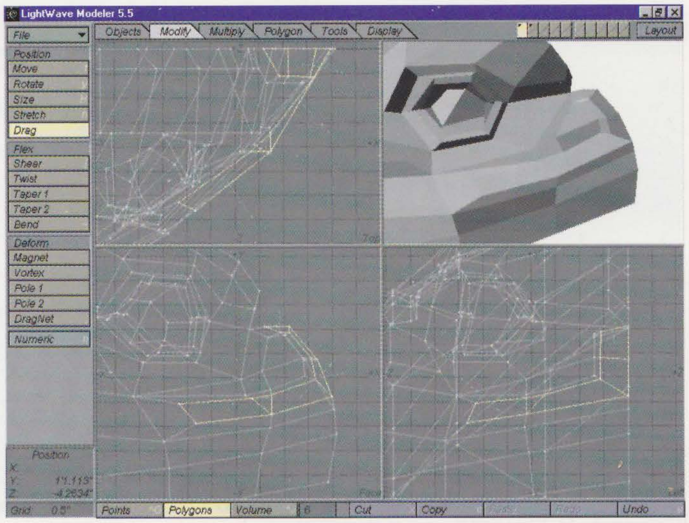
Grid 0.5"
Points
Polygons
Volume
Cut
Copy
Undo

Figure 1.19 Starting the nose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Magnet
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Pole 1
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Points
Polygons
Volume
Cut
Copy
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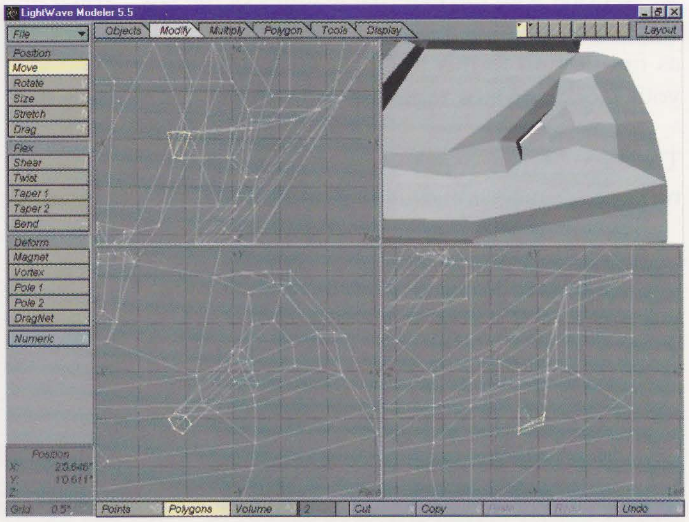
Figure 1.20 Creating the nose ridge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Size
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Drag
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Taper 2
Bend
Deform
Magnet
Vortex
Pole 1
Pole 2
DragNet
Numeric
Grid 0.5"
Points
Polygons
Volume
Cut
Copy
Undo

Figure 1.21 Creating the nostril

shift them outward. You'll have to do some point tweaking to get it right. You should have something like the image in Figure 1.20.

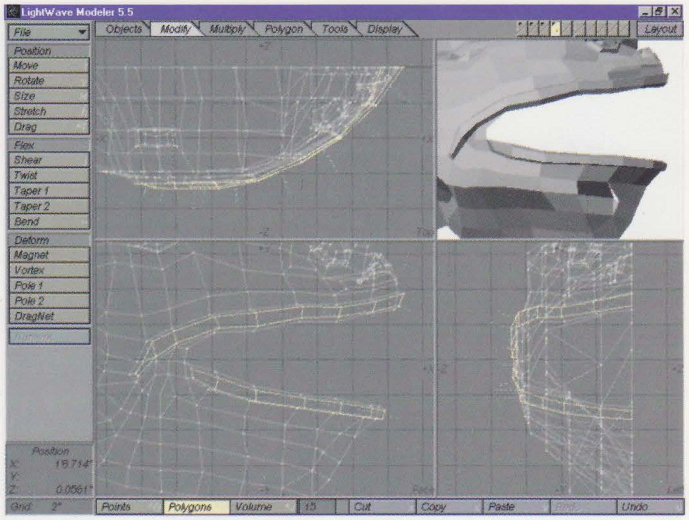
You'll also notice that the last polygon (the one closest to the eye) needed to be split so the shape was correct. This can be done with the Knife tool, or by manually adding a point to the leading edge. Either way works very well. To create the nostril, simply Smooth Shift the two polygons in the center of the nose 3 times back and down into the head, as shown in Figure 1.21.

Well, that does it for the nose. We're ready to tackle the mouth.

Modeling the Mouth

This will take some work. The first thing we need to do is create the outer detail of the mouth and jaw. Then we'll tackle the gums and teeth. Start by selecting the points at the base of the jaw and pulling them outward a bit. It doesn't really matter which points you select, just 'eyeball' it to ensure the mouth is rounded.

Next, we need to create the ridge on the upper and lower rim of the jaw. Do this by selecting the polygons that run along the jaw and Smooth Shifting them outward. Be sure to keep the points along the center axis where they are. The best way to do this is move the polygons forward first, then stretch them outward to the desired position. When you're finished, you should have something similar to Figure 1.22.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Taper 1
Taper 2
Bend
Deform
Magnet
Vortex
Pole 1
Pole 2
DragNet
Points
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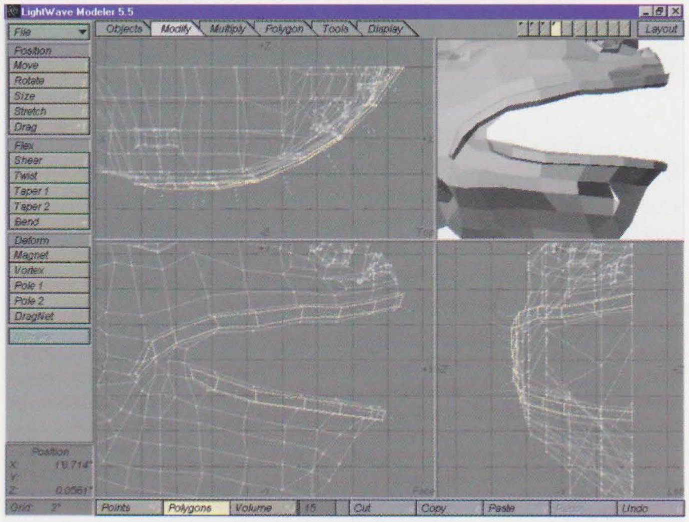
Volume
Cut
Copy
Paste
Undo
Grid 2"

Figure 1.22 Creating the jaw line

Now repeat the same steps to create the fold of skin under the lower jaw line shown in Figure 1.23.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Twist
Taper 1
Taper 2
Bend
Deform
Magnet
Vortex
Pole 1
Pole 2
DragNet
Points
Polygons
Volume
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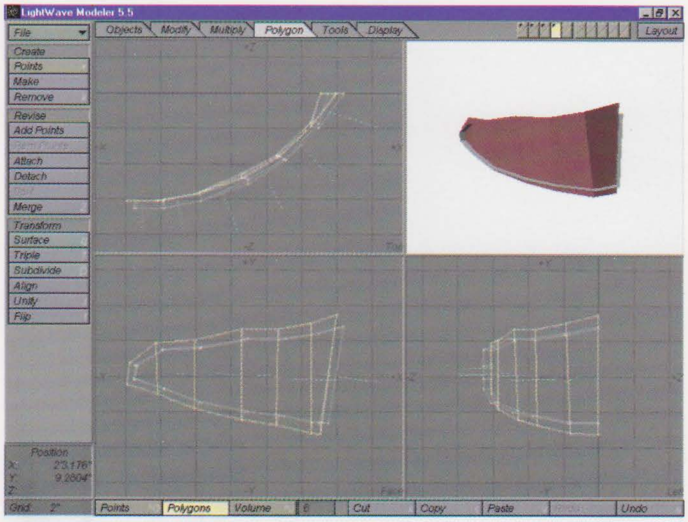
Copy
Paste
Undo
Grid 2"

Figure 1.23 Creating the fold of skin under the lower jaw

Great, we're almost done with the jaw! Now we need to strengthen the back of the jaw where it meets the neck. To do this, select the polygons at the back of the jaw and move them back, so they overlap the neck polygons just a bit. Then you'll need to tweak the selected polygons from the "X" viewport to round the jaw line as shown in Figure 1.24.

We're done with the external features of the jaw. You'll find a model named jaw.lwo in the support file. This is the model as finished up to this point. You can use to compare with your model, or as a replacement in case you missed a step.

The next step is to create the teeth and gums. This is relatively simple job, but a bit repetitive. Let's get started.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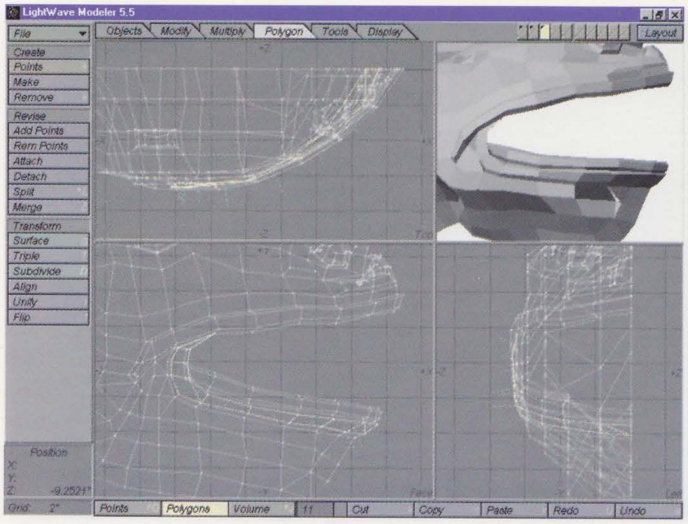
Transform
Surface
Triple
Subdivide
Align
Unify
Flip
Points
Polygons
Volume
Cut
Copy
Paste
Undo
Grid 2"

Figure 1.24 Strengthening the jaw

Creating the Teeth, Gums and Tongue

I'm sure you noticed that we have a large hole where the inner mouth should be. This was done for a reason. What we want to do is manually create the polygons for the gums. This permits greater control over their appearance. The first step is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Flip
Position
X:
Y:
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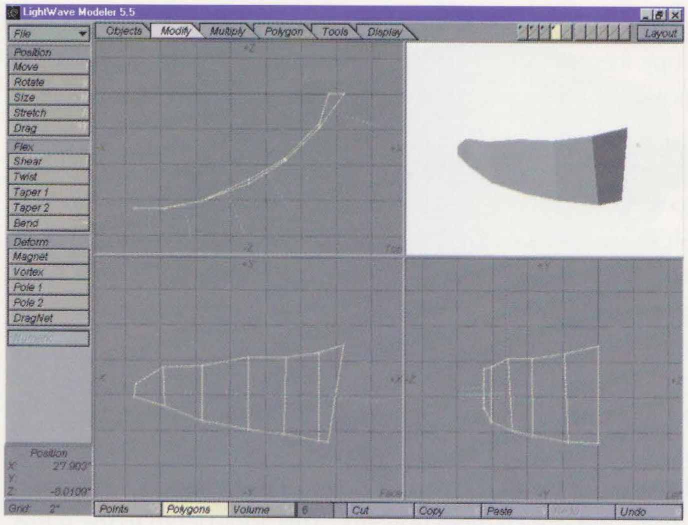
Grid 2"
Points
Polygons
Volume
11
Cut
Copy
Paste
Redo
Undo

Figure 1.25 Creating the inner mouth polygons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Size
Stretch
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Shear
Twist
Taper 1
Taper 2
Bend
Deform
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Vortex
Pole 1
Pole 2
DragNet
Position
X: 27.903"
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Points
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Volume
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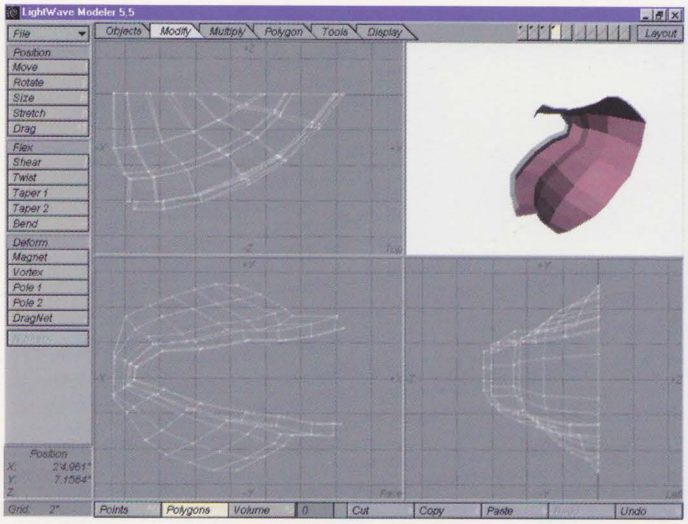
Cut
Copy
Paste
Undo

Figure 1.26 Creating the ridge of the mouth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Deform
Magnet
Vortex
Pole 1
Pole 2
DragNet
Position
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Grid 2"
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Polygons
Volume
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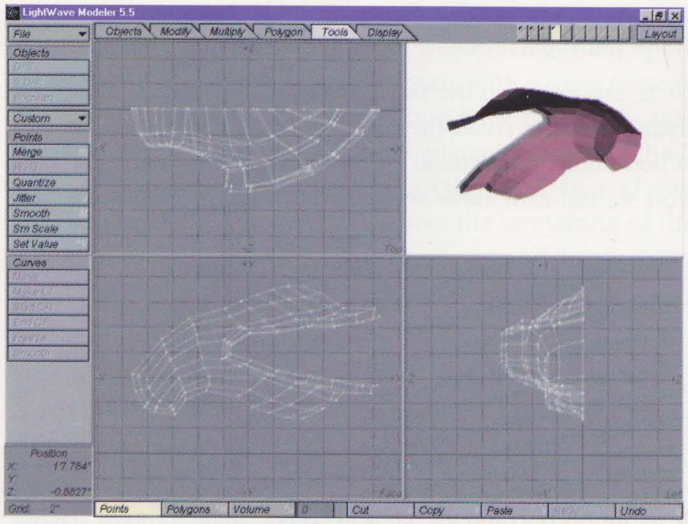
Undo

Figure 1.27 Modeling the inner mouth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Jitter
Smooth
Sm Scale
Set Value
Curves
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Points
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Cut
Copy
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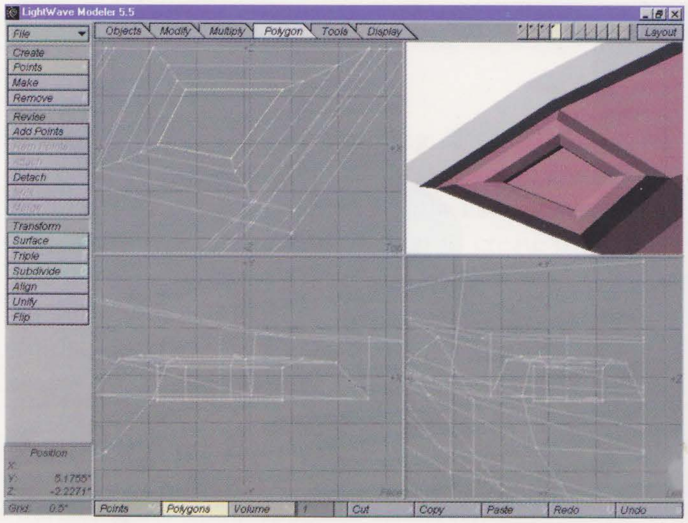
Undo

Figure 1.28 The completed throat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Subdivide
Align
Unify
Flip
Position
X:
Y: 5.1755"
Z: -2.2271"
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Points
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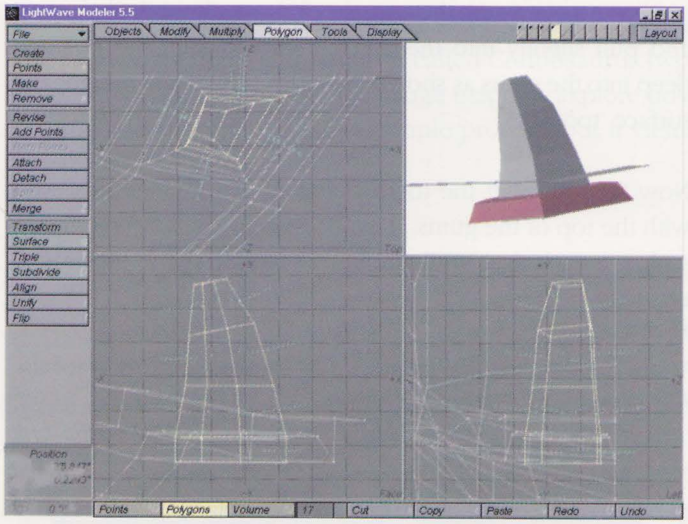
Figure 1.29 The gum hole for a tooth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Surface
Triple
Subdivide
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Flip
Position
Points
Polygons
Volume
17
Cut
Copy
Paste
Redo
Undo

Figure 1.30 A completed tooth

to select all the points along the inside edge of the mouth and copy them to another layer. Now create polygons between the points of the upper and lower jaw as shown in Figure 1.25.

Smooth Shift these polygons, and stretch them inward and back to create a thin ridge on the inside of the mouth. Now Smooth Shift them again, and stretch them upward and back a bit (but not inward). What we are doing is creating the depth of the gums. Rename the selected polygons to 'gums,' and make them pink as shown in figure 1.26.

Now comes some tricky work. First, Smooth Shift the new gum polygons and stretch them inward to create a thick ridge, like you did with the mouth ridge. Then, Smooth Shift them again, and stretch them upward. This adds depth to the gums for the teeth, just as we did with the mouth ridge. If you get lost, there is an object named gums1.lwo in the support files, which you can use as a comparison. It won't work with your model because points will be in different locations, but you'll be better able to understand the foregoing steps.

Next, Smooth Shift the polygons two more times, stretching them upward to create the curvature of the inside of the mouth. When finished, delete all the polygons along the center axis. You should now have something similar to Figure 1.27.

Now select the polygons at the back of the throat. Smooth Shift them back into the body three times, rotating and scaling them as you go. Then, select the polygons along the center axis and delete them. Finally, select all the points along the center axis and set their value to zero on the Z axis. You should now have something like Figure 1.28.

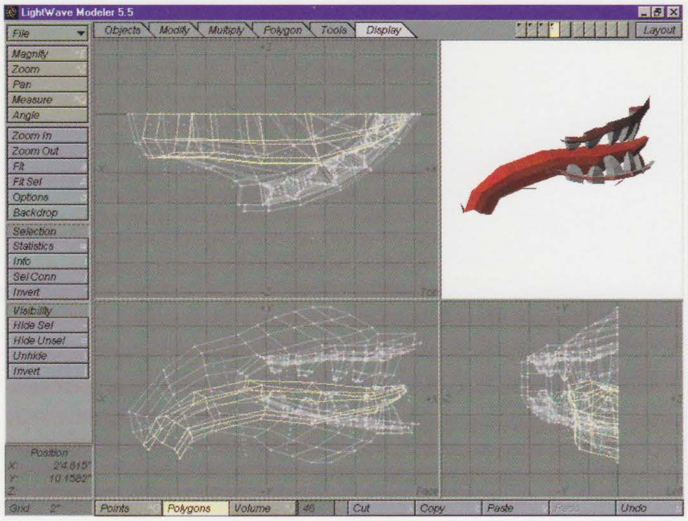
Now we need to add the teeth. This is a simple process. Here's how it's done:

Select one of the polygons on the gum ridge and Smooth Shift it up a bit. Smooth Shift the polygon again and scale it down, but leave it even with the parent polygons. Smooth Shift again and pull slightly into the gums. Smooth Shift the polygon deep into the gums as shown in Figure 1.29. Then rename the surface 'tooth,'

Now Smooth Shift the tooth polygon upward until it's even with the top of the gums. Finally, Smooth Shift it three times, scaling it each time until you have a tooth like the one in Figure 1.30.

That's how the tooth is created. Just repeat the process for the rest of the lower and upper teeth.

Now it's time for the tongue. Select the lower six polygons at the base of the throat. Give them a new surface called 'tongue.' You should also color them red. Now Smooth Shift the poly-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Invert
Position
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Points
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Cut
Copy
Paste
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Undo

Figure 1.31 The completed tongue

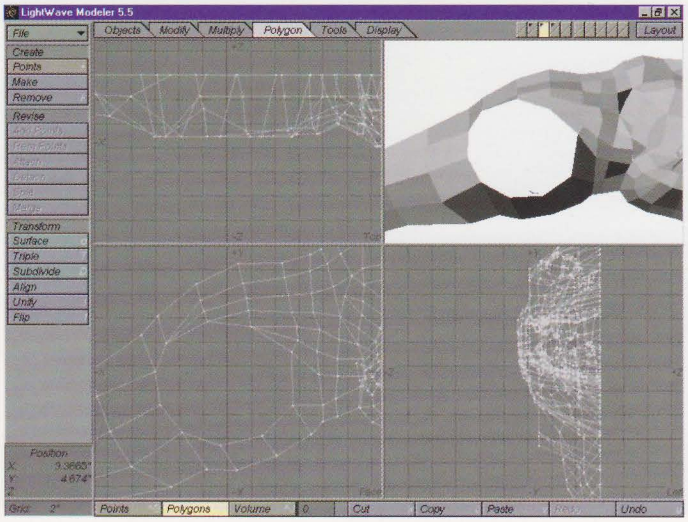
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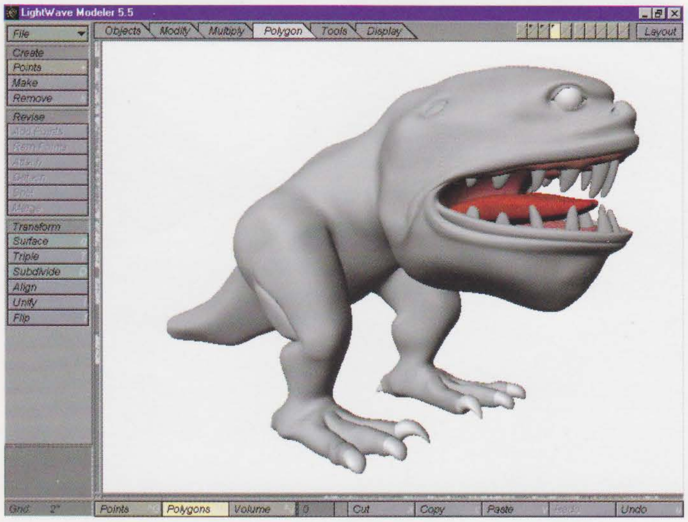
Figure 1.32 Flattening the hip polygons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Align
Unify
Flip
Grid: 2"
Points
Polygons
Volume
Cut
Copy
Paste
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Figure 1.33 The completed Craniosaurus model

gons several times, scaling them and positioning them so you have something like the tongue in Figure 1.31.

That does it for the mouth. Now cut the mouth object, and paste it in the body layer. Merge the points. Here we have the completed body. The only step left is to add the legs.

Attaching the Leg

Attaching the leg is fairly simple. First, load the leg.low object into a separate layer. Now reapply the template image in the background layer, and position the leg over the body. Then select all the polygons that cover the flat side, where the leg is severed. Cut these and past them into another layer. Then select the model layer as the foreground, and the layer with the severed leg polygons as the background.

Select the polygons on the body where the leg is to be attached. Stretch them until they are flat, then delete them as shown in Figure 1.32.

This will make it much easier to attach the leg. Once we have the leg attached to the body we can adjust the hip points. Use the Drag tool to position the points on your model's hip to match the point location on the leg. You'll find that the points in the background layer will 'disappear,' so you'll need to refresh them by swapping layers. It's a bit annoying but gets the job done.

With all the points now in place, swap layers, and move the leg so it's points overlap the hip points. Then cut the leg and paste it in the body layer. Select the points where the leg meets the hip and use Merge Absolute, with a small setting like .2". This setting will vary with the size of your model, so you'll need to experiment. Keep tweaking the number until you've merged all ten points. Now you can tweak the points along the hip, to smooth the transition between the hip and thigh. When finished, you should have something similar to the model in Figure 1.33.

OK, that does it of the modeling of our Craniosaurus! Of course, the sketch has many skin folds and creases, but those are easy to add. Simply use the same technique of Smooth Shifting we used to create the ridge of the jaw line. It should take about 2 hours of tweaking to fully detail this little critter with those killer skin folds.

Surfacing the Beast

Surfacing the Craniosaurus is relatively simple. I've used a few tricks to surface the creature so it's both seamless and shows no sign of stretch marks. The trick is to use a cubic image map as the base coat of surfacing, then apply planar maps for the details. We start with a very generic cubic image map to coat the creature with a seamless skin texture. Then we apply a detailed planar map along the Z axis, setting the Opacity to 70% (so the cubic map shows through). The cubic map will offset the stretching of the planar map. This allows us to create specific details without the cost of stretch marks of complex surfacing.

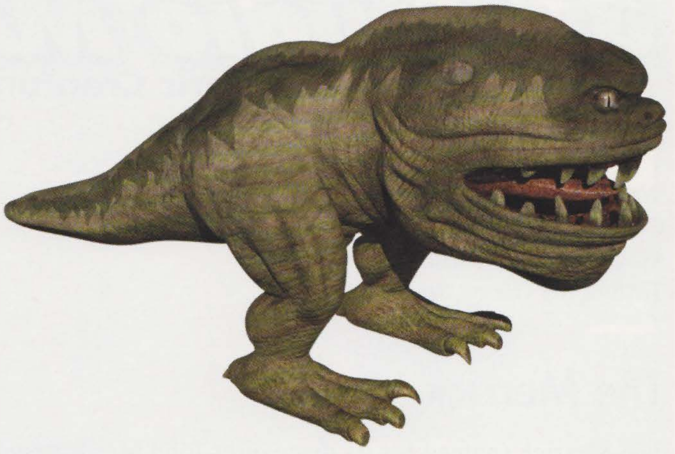


Figure 1.34 The fully surfaced Craniosaurus

Another trick I used was to add color shifting on the surface along the back and head using a color image map with an Alpha channel. The Alpha image map was used so only a specific portion of the image map shows. Then, the opacity was set to about 70% to allow the detailed texture of the planar and cubic maps to show through. Now we have detailed color without any stretch marks. It's an invaluable technique for adding detailed surfacing to your models. Figure 1.34 shows the fully surfaced Craniosaurus.

You'll find the fully surface model and it's image maps in the support zip file. The model is called Craniosaurus.lwo. Take some time to examine the image maps — explore how the model was surfaced. It's a simple process, but it yields great results.

Wrap Up

There you have it — prehistoric creature modeling with LightWave 5.5. While the 'flat' modeling method takes a bit of getting used to, it really simplifies the process of adding detail to your models. Before you begin your next creation, think about 'going flat.'

3D Studio MAX

Prehistoric Creature Modeling

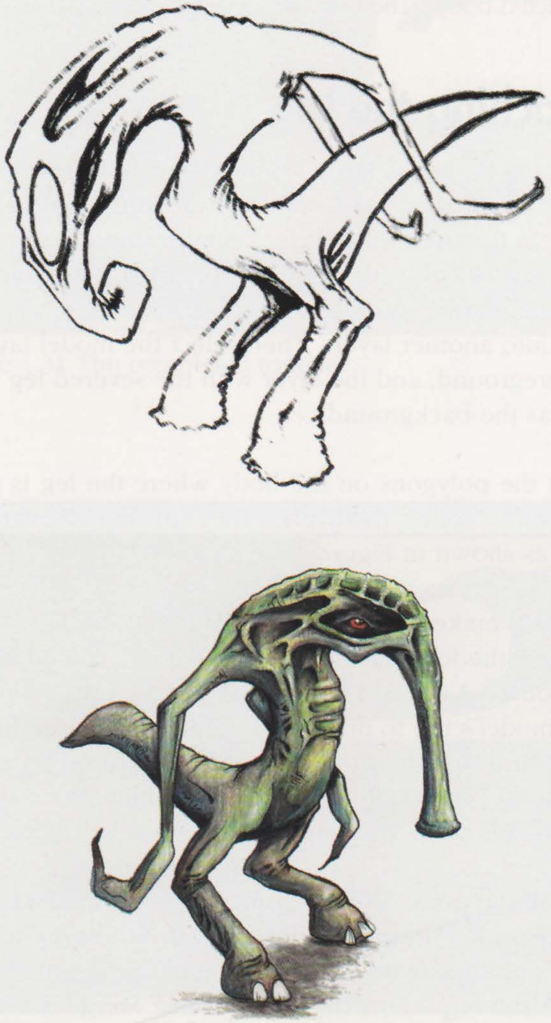
Written by Sunny Strasburg
Concept Sketches by Garrett Smith and Sunny Strasburg
Model Created by Corey Kruitbosch
Textures by Garrett Smith

The Merrick

The Merrick (named for its discoverer John Merrick) was an enigmatic parasite. Along with its host the woolly mammoth, it appears to have become extinct in the late Pleistocene. Amber mining operations of Ice Age deposits in Siberia have uncovered extensive, often well preserved remains of mammoths and other contemporary mammals. Found along with many of these remains are those of the Merrick, an unlikely looking biped.

Sharing characteristics of both anteaters and ticks, some speculate that Merricks descend from these two common ancestors, a rather bizarre example of convergent evolution. Adults measure approximately 15 centimeters in length, about the size of the common chipmunk. The Merrick's unique 'proboscis' appears to have evolved to protect its only tooth, a special hollow fang. Using this fang, the Merrick fed on the blood of the mammoth, clinging to the dense wool with its two long, clawed arms. The Merrick's rugged skin provided the necessary protection against the mammoth's attempts to rid itself of the parasite.

The abundance of these recent finds suggests the Merrick was very successful, until the demise of its mammoth host in the late Pleistocene era.



Figures 1.1 and 1.2 Artist Conceptual Sketches

Merrick: Overview

When creating concept sketches, you need to consider what your model will be used for, and your deadline. For example, will your character be animated? Will it always be seen from a distance? If so, the model doesn't require as much detail - you'll be able to substitute detailed texture maps for actual object geometry. If the model *will* be seen up close, the mesh should be high resolution, and include details such as eyelids and fingernails.

You must also consider whether there will be any facial animation. If so, you should create the gums and teeth. You should also make the face high resolution for creating morph targets. Then, consider how the character's look and feel should be modeled. Our tutorial creature isn't one that does a great deal of talking, so we can pri

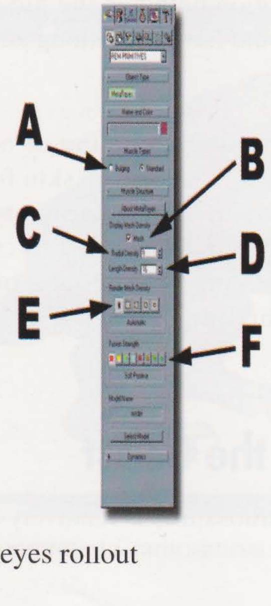


Figure 1.3 MetaKeyes rollout

marily focus on the body details. Let's take a look at the artists' conceptual sketches of the Merrick creature, shown in Figures 1.1 and 1.2.

As you can see by the sketches, the Merrick is a very detailed creature. If we attempted to model all the details, this tutorial might take months! Instead, we'll model the major distinguishing details, and accomplish the smaller ones using bump maps. Since the Merrick is defined and muscular, MetaReyes is a perfect tool for its creation. Let's take a look at MetaReyes.

MetaReyes Overview

You can add possibilities to 3D Studio Max with third party plug-ins like MetaReyes. If you haven't bought a copy of MetaReyes, go to their web site (www.infografica.com) and download the demo. You'll need it to complete this tutorial. The only thing missing in the demo file is the 'Save' function, but that won't prevent our completing this tutorial.

MetaReyes is a modeling and animation plug-in for 3D Studio Max. It combines metaballs and splines, which are called 'metamuscles.' A metaball is created, and then a spline connects another metaball to it, forming a smooth skin surface. Let's open the MetaReyes rollout and become more familiar with the program. Go to the Create, REM Primitives rollout and view the Tools panel, which is shown in Figure 1.3.

Let's consider each of the tools, and the role it plays in organic modeling. Muscle Types are 'standard,' or 'bulging' muscles. The default is 'standard,' which is what we will use for the Merrick. Standard muscles are most commonly used for modeling. Bulging muscles are used for animation. They bulge and stretch like real muscle when placed between two moving points.

Display Mesh Density relates to how the objects are seen in the viewports. When Mesh is unchecked, the metamuscle is displayed in cross sections composing the radii of the metaballs and the splines. When Mesh is checked, the skin of the metamuscle is displayed.

Radial Density pertains to the resolution of the radii of the object in the viewport. Length Density is the density of the mesh along the splines. The higher these numbers are, the denser and more detailed the mesh will appear.

Render Mesh Density operates the same as Radial and Length density, but pertains to the rendered objects.

Fusion Strength gives you different colored boxes that correlate to different influence strengths of the metaball Some have a positive attraction, while others are neg tive. From left to right; red is soft positive; yellow is medium soft positive; green is medium hard positive; blue

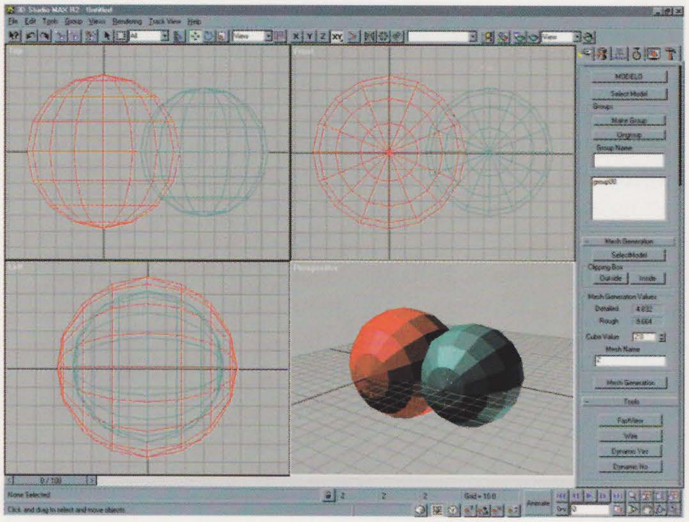


Figure 1.4 The effect of negative influence metaballs

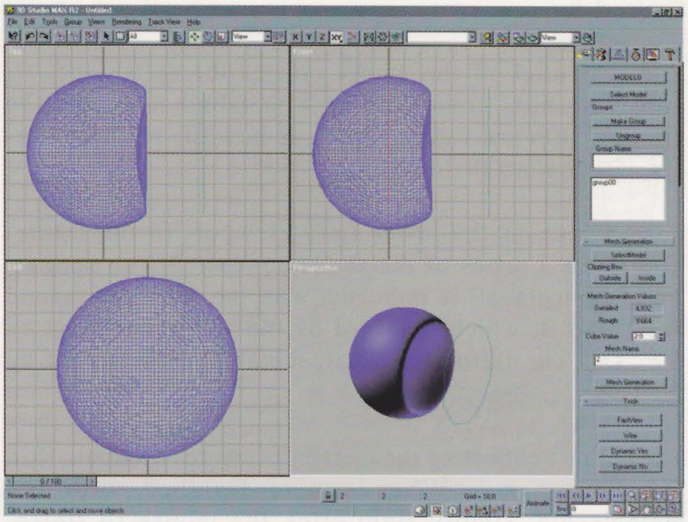


Figure 1.5 The effect of negative influence metaballs

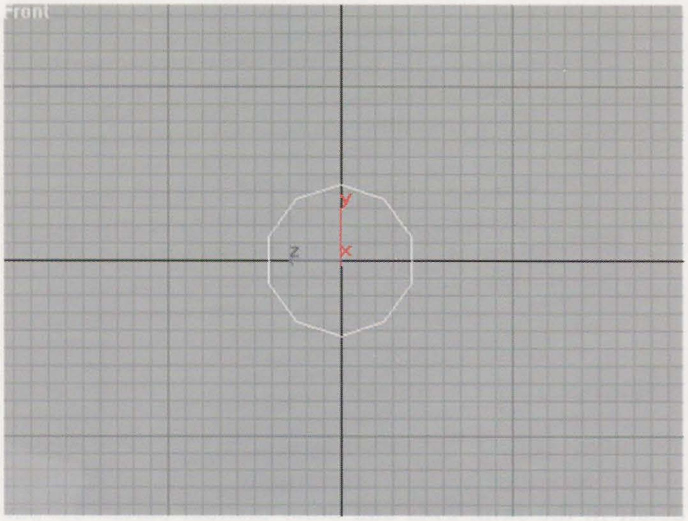


Figure 1.6 through 1.8 Creating the first metaball

to make the fourth metaball slightly larger, to strengthen the joint in the torso. Finally right click the mouse to finish the metamuscle. You can now click on Fast View in the Modify panel to see the final mesh, shown on the right side of Figure 1.11.

Now let's go to the shoulder area. We want to create metamuscles that give the torso bulk. Using the same technique you used in creating the torso, lay down a series of metaballs as shown in Figure 1.12.

The shoulder metamuscle is shown in red. Create the fist metaball a little above and near the center of the torso. Then, create a small, spherical metaball next to the first one to create the width of the shoulder. The next metaball starts running parallel to the torso. Keep adding the metaballs, as shown in Figure 1.12, until the shoulder metamuscle travels up and back into the body.

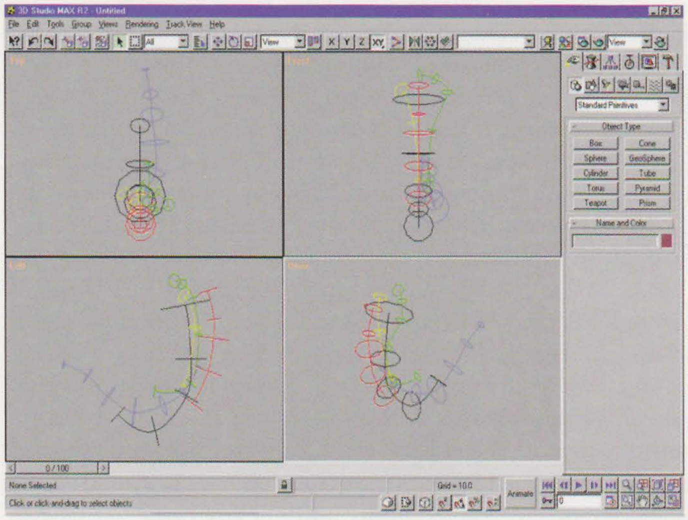
Now it's time to add more bulk to the body, by creating the metamuscle for the abdomen and tail/spine. Refer to figure 1.13, and you'll see several colors, indicating the different metamuscles in the body. The green metamuscle in the image indicates the shoulder muscle we created earlier, while the black metamuscle is the original torso.

You'll want to create a metamuscle below the torso to make abdominal muscles. Refer to the red metamuscle in Figure 1.13 to create the metaballs for the abdomen. Then, create a long metamuscle for a tail and spine, like the blue one in the same figure. Finally, create the small metamuscle shown in yellow. This small metamuscle adds bulk to the body.

To complete the body, mirror the metamuscles by selecting one and choosing mirror. Now restrict it on the X-axis, and move it into place on the opposite side. Do the same for the shoulders, tail, and metamuscles that fill the area between the torso and the shoulders.

You may want to change the details of the body somewhat. You can edit the metaballs and splines on the vertex, or radii level, by going into the Modify panel and choosing Edit Muscle. The default setting is Edit Vertex, which allows you to move the metaballs in the viewports. "Insert mode creates more metaballs along the spline, while Delete" removes metaballs. Edit Angles rotates the metaballs, and Edit Segment scales the metaballs along an axis. The other Sub Object choice is Edit Radii, which allows you to scale the radius of each metaball along the metamuscle.

Notice how all the metamuscles together make up the body. You can see the basic torso object is at the center. The other muscles lie around it, giving the body detail. Remember, this is where the details of realistic creatures are added to the model. You can add as much detail as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Tube
Torus
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Click or click-and-drag to select objects

Figure 1.13 The completed metamuscles of the body

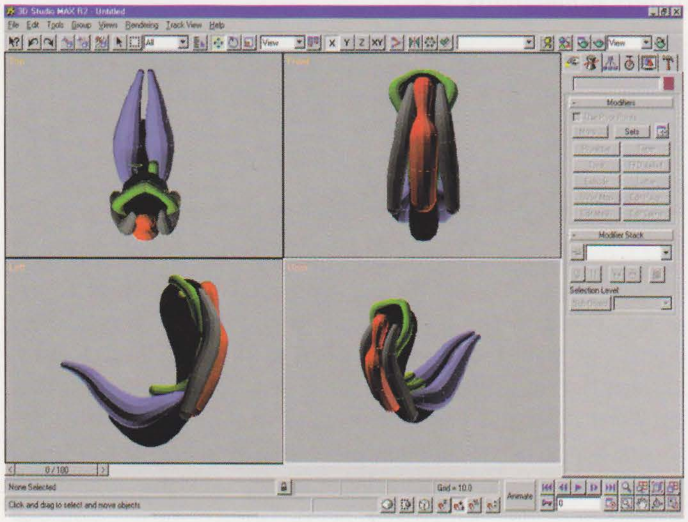
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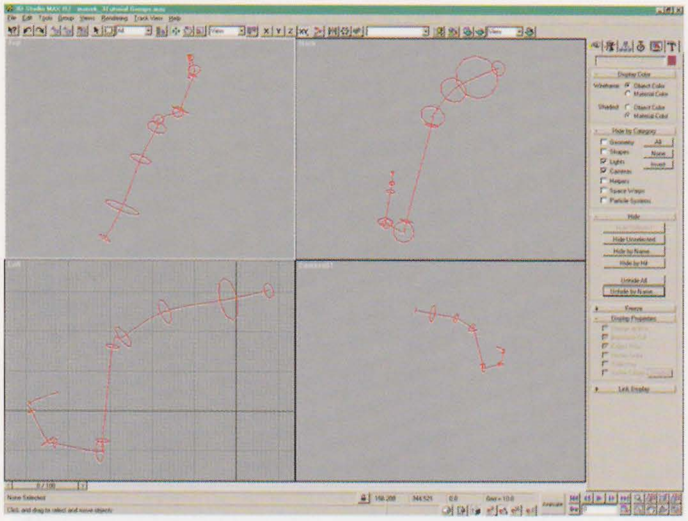
Figure 1.14 The body in Fast View mode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Click and drag to select and move objects

Figure 1.15 The Merrick arm

you'd like, simply adding or removing metaballs in the metamuscles.

Now let's take a look at modeling those arms.

Modeling the Arms

The arms need to be long and muscular so our Merrick can grasp onto its host with a solid grip. The hands are strong, and claw-like. It's essential to maintain awareness of the personality of your character so it's features and details make sense. This helps you keep all the detail you create consistent with the style of the character sketches. In the end, it makes the creature more believable in the eyes of the viewer.

You create an arm by following the process for the torso. Use Figure 1.15 as a guide for creating the metaballs. As you create the hand, make the radius of the metaballs smaller and smaller as you get to the claw.

Be sure to bend the spline at a sharp angle at the wrist, to give it a jointed look. It's a good idea to toggle between wire frame and smooth mode to see how the model is progressing. It will also help you identify potential pinching areas. When you're finished with one arm, select all of its splines and metaballs and mirror, specifying "copy. Then, move the other arm to the opposite side of the torso, restricting movement to the X-axis in the front viewport. You should now have something similar to Figure 1.16.

All right, that was fairly simple. Let's move on to something a little more tricky, the legs.

Modeling the Legs

We'll create the legs using the same process as the arms and torso. Of course, there are several metamuscles to be created, so you'll need to pay strict attention to the reference image. Take a look at Figure 1.17, which represents the metamuscles of the leg. The blue metamuscle makes up the main leg, and the others create its muscular details.

First, create the main leg metamuscle by making a spherical metaball in the left viewport. Then create the spline, and drag downward to create another metaball, then yet another just beyond it. Make a fourth metaball to represent the termination of the thigh muscle. Then, at that spline, create a sharp angle for the backward knee joint, and create the fifth metaball. Drag the spline at a forty-five degree angle, and create the sixth metaball just above the ankle. The spline will then continue downward at another sharp angle to the seventh metaball - the eighth one forms the foot. Be sure to scale the metaballs as shown in Figure 1.17.

Finally, a negative metaball is used to create a concave shape on the bottom of the foot. Select a negative color

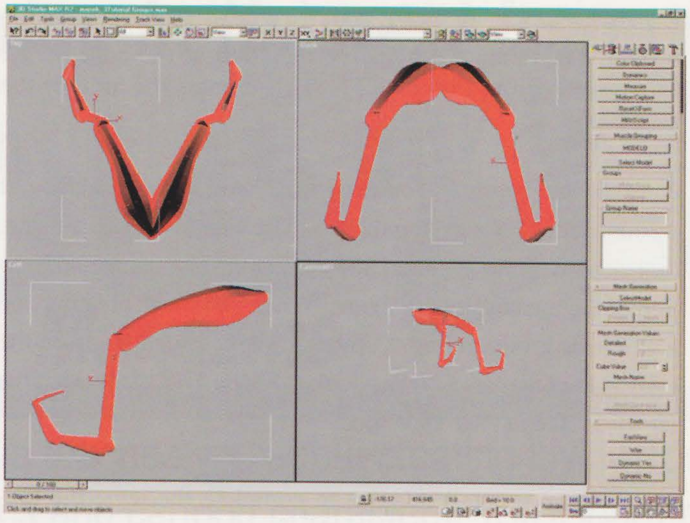

Figure 1.16 The mirrored arms

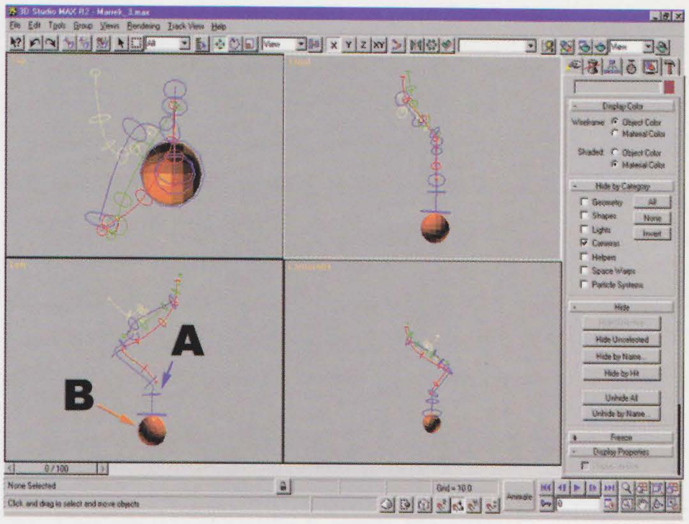

Figure 1.17 The leg metamuscles

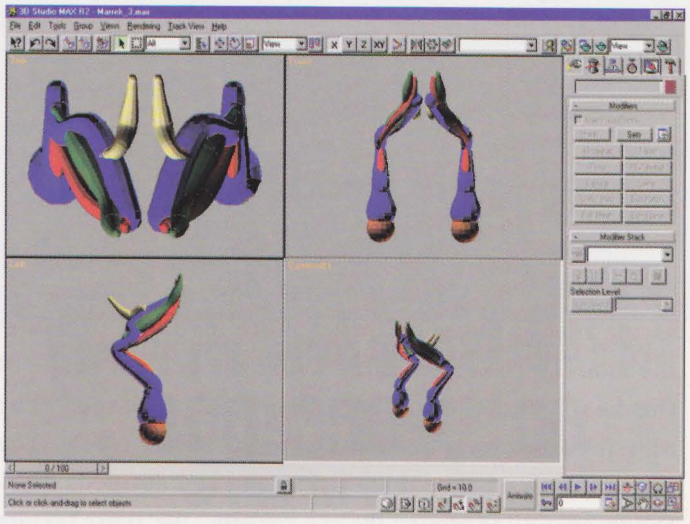

Figure 1.18 The completed legs in Fast View mode

for the metaball in the Create, REM primitives, such as brown. Then create a negative metaball at the base of the foot, as shown in Figure 1.17. This creates the arch of the foot.

Now the fun begins! You need to create the three additional metamuscles that make up the leg. Use Figure 1.17 as a guide. Take it slowly, paying strict attention to the alignment and rotation of the metaball in the figure. When you finish creating one leg, mirror it (specifying "copy) and move it into place on the other side of the torso. Take a look at Figure 1.18 to see what the leg looks like in Fast View mode.

Just one more detail remains to complete the legs: the toenails

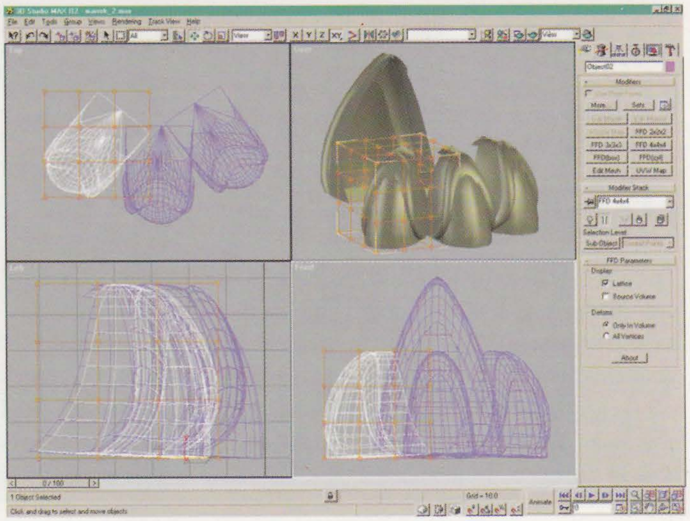

Figure 1.19 The Toenails

Creating the Merrick Toenails

The toenails are made next. First, create a hemisphere, using the default settings. Place it at the base of the foot. Go to the Modify panel, and select FFD4x4. FFD4x4 comes in Max2 as a default modifier - it gives you handles to move specified areas of the mesh. It's particularly useful for distorting, or fine-tuning an object. Press the Control Points button in the rollout to make sure Move is selected. Now you can select the control points and move them around. Continue this process until the toenails are distorted into a shape you're happy with. Refer to Figure 1.19 to see the toenails.

Repeat this process to create the other toenails on the foot, then mirror them to the other leg. You'll need to adjust them again after you create the final mesh, so they fit perfectly along the contour of the feet. To do this, just enable the Control Points again in the Modify rollout and adjust them.

Now we're ready to create the crowning element, the head!

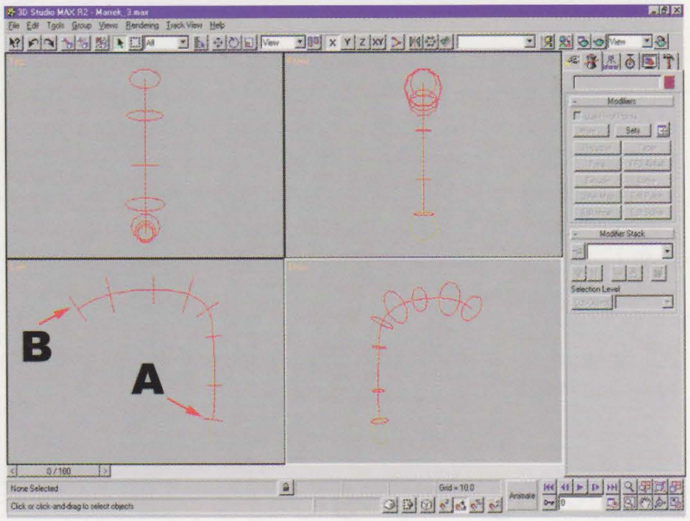

Figure 1.20 The Head

Modeling the Head

A character's head is often the most complex aspect of the model. Don't be intimidated. It's the same process as the rest of the body, just a more involved. Look at the character sketch - think about the general shape of the head, and the general shapes in the face. The Merrick has a long head and a long, tubular trunk. The eye sockets and cheekbones are bony and defined. They follow an outline around the eye sockets. We'll use texture maps to carry much of the facial detail, but we will still

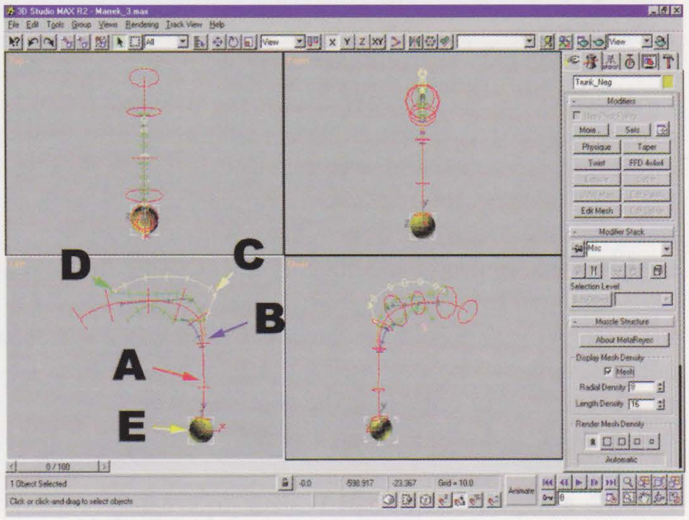

Figure 1.21 The Merrick head details

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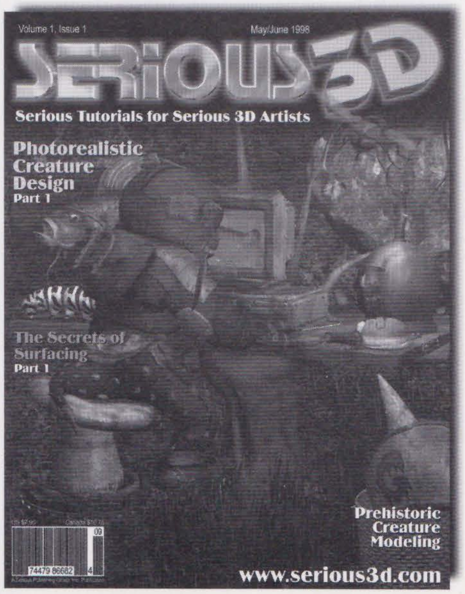
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need to add some definition to the head.

The head will be created in the same manner as the rest of the body, though the mesh has more detail. First, we'll create the basic structure for the head. It's a long tubular shape. Referring to figure 1.20, create the metamuscle starting with the metaball indicated with an A, and ending with the metaball indicated with as B".

Now it's time for a little more tricky work. You need to create the details like eye sockets and cheekbones on top of the basic head armature. The details are shown in figure 1.21.

A) Main head metamuscle
B) A small muscle that joins the eye socket and trunk
C) The head crest metamuscle
D) Eye sockets
E) The negative metaball created to make a concave surface on the bottom of the trunk.

Again, take it slow and pay close attention to the references in Figure 1.21. When you are finished creating the different metamuscles of the head, mirror the eye socket specifying "copy," and move it on the X-axis into place. Figure 1.22 shows the Merrick's head in Fast View mode.

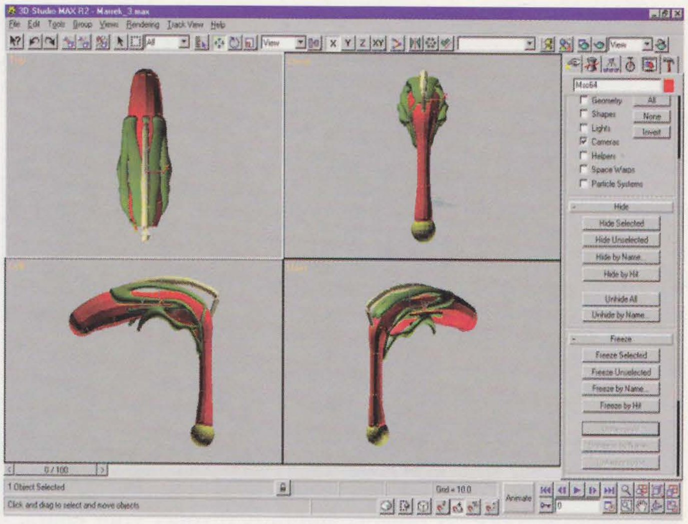
OK, that does it for the individual body parts. Now it's time to put it all together.

Putting It All Together

Each body part will now be put into separate groups. We do this by linking all the metaballs to each spline. For example: all the metaballs in the right arm are linked to a common right arm spline; the right leg metaballs are linked to a common right leg spline, and so forth. It is unimportant which spline in each group is the parent. It's for the Utility's reference only.

Go to the Utilities panel and select the MetaReyes Utilities rollout. Click Select Model, and choose the parent spline for each group (for example, the parent right leg spline that the other leg metaballs are linked to) and press Make Group. Type in the group name in the provided box, such as Right Leg. Continue this process for all the body parts.

Now go to the Tools area below, and choose Fast View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Unhide by Name
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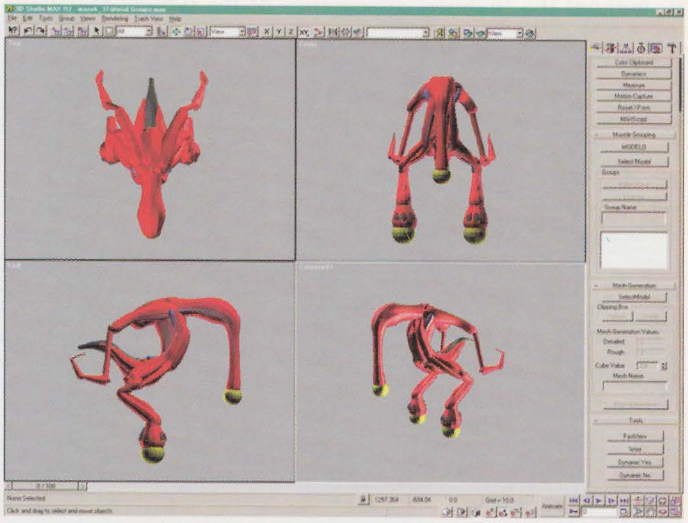
Click and drag to select and move objects
Animate

Figure 1.22 The Merrick's Head in Fast View mode



1.23 Grouping Individual Body Parts

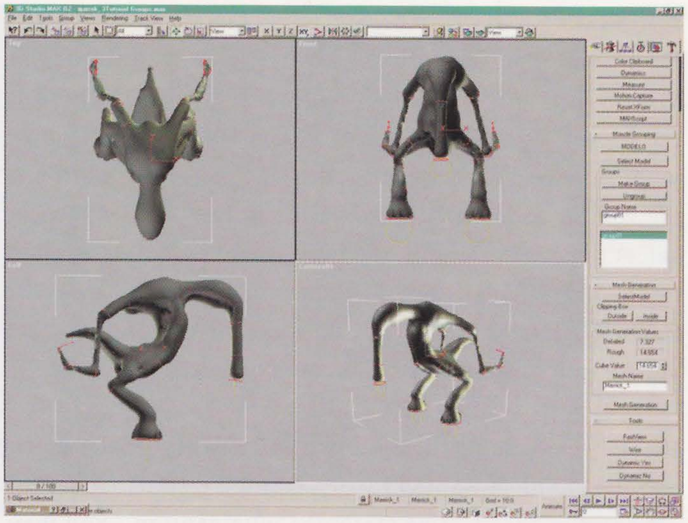


Figure 1.24 Creating a mesh

to see your model in shaded form or in wire frame. You should have something that looks like Figure 1.23.

It looks like we're getting somewhere doesn't it? We now have a very good idea of what the creature will look like. Once satisfied with your MetaReyes model, you'll probably want to create a final mesh. You do this by going to the Utilities, MetaReyes Utilities rollout. Select the group you would like to snapshot and the cube value (the lower the number is, the denser the mesh will be), and press Mesh Generation. Now you have a separate mesh that is independent from the MetaReyes information.

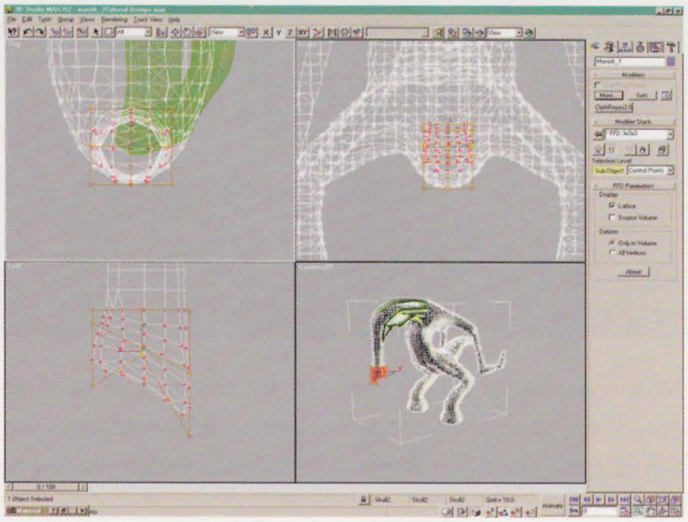
Hide your MetaReyes objects and only display your character mesh. Your scene should look like Figure 1.24.

You can see how the Merrick model has a very organic feel to it, without the 'bubbly' appearance of the typical metaballs method. Of course, this model will probably require a bit of tweaking before it's 'just right.' Let's take a look at how we modify the mesh.

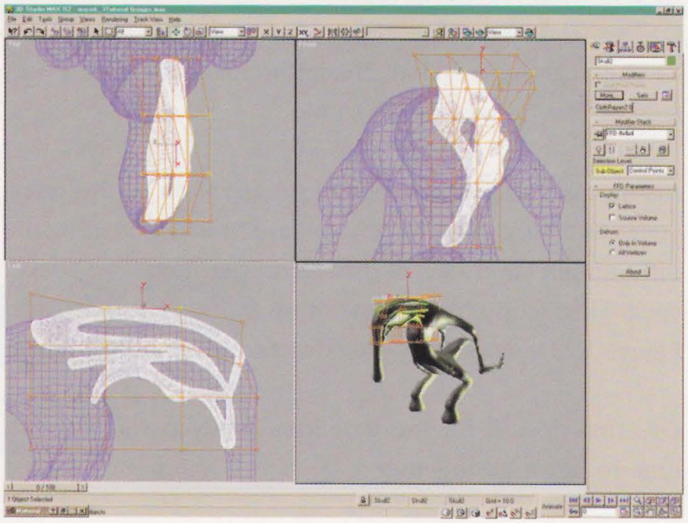
The Details

After the mesh is created you may want to work on it a little more. You can use FFD4x4 to tweak the pelvis, feet, eye sockets and tail. It's rare that your parts will line up perfectly, so some tweaking with FFD4x4 will be necessary. The two main areas of the body that need to be modified will be the trunk tip and the head. You'll want to give the trunk a sloping shape, to make it appear more natural. You'll also want to deform the head details to follow the contours of the head.

To create the modifications, go to the Modify rollout and select Edit Mesh. Turn on Sub Object mode and go to Vertex. Select the first area of vertices you want to adjust. With Sub Object mode still selected, choose FFD4x4 in the Modify list. The Control Points should only enclose your vertex selection. Press the Control Points button in the rollout to make sure Move is selected. Now you can select the control points and move them around. Continue this process for all the areas on your model you want to fine tune. Examine Figures 1.25 and 1.26 to see the changes you should make to the trunk and head details.



Figures 1.25 Tweaking the trunk and head details



Figures 1.26

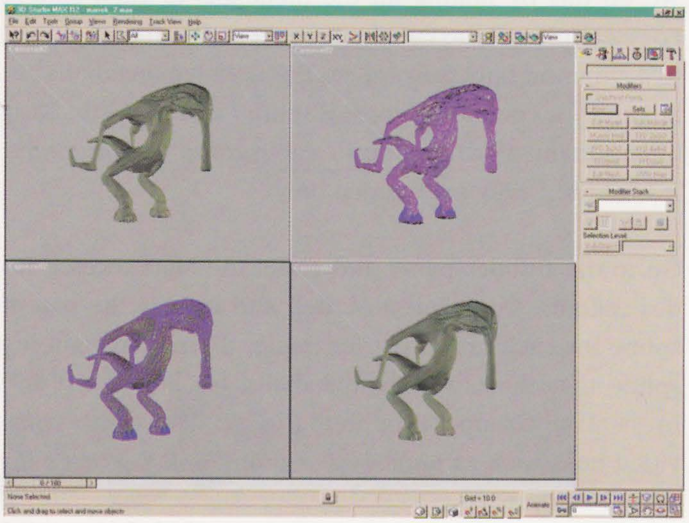


Figure 1.27 The optimized mesh

Finally, we want to bring down the density of the mesh, and get rid of unwanted faces. Optimize is also a default modifier in Max2. Use Optimize with caution. You may want to lighten up your mesh, but you probably don't want to change the look of it. It can also be made useless for animation if you wind up with too few vertices to deform. However, you can limit the effect of optimization by lowering the Face Threshold. Try the default first, then experiment with how much you can get away with, higher or lower. At this point, your model should look like Figure 1.27.

OK, now we're done with the modeling of the Merrick. The next step is to bring this creature to life with image maps.

Texture Maps

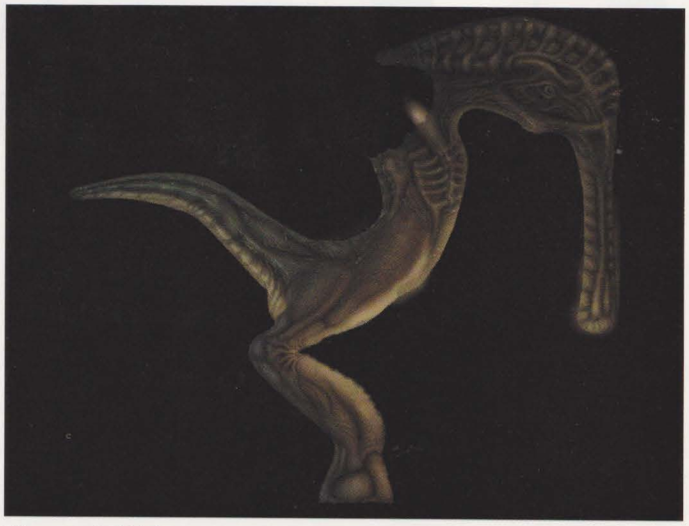
When you are pleased with the mesh, apply UVW mapping coordinates for the textures. We want to spend a bit of time on the textures, because they're responsible for much of the detail of our character. Render screen shots of each object in the left viewport, and use them as templates in a paint program like Adobe Photoshop. Save your image maps in your 3d Studio Max maps directory. Select an object such as the head. Go to the Modify panel, and choose UVW Mapping. Select Planar map, and press the Fit button. Bring in your texture maps using the Materials Editor and apply them. We used two texture maps, one for the body and one for the arms. Please refer to figures 1.28 and 1.29 to see the texture maps.

Final Results

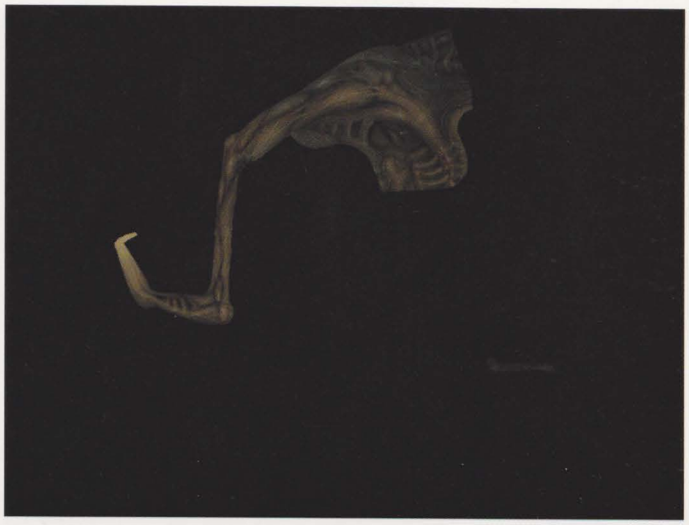
At last we have a completed Merrick! Look at figure 1.30. How does your model compare? We hope it went well, and that you enjoyed the process!

3d Studio Max offers many ways to model. MetaReyes is just one. It's a great tool for modeling long, flowing types of characters! You can also use MetaReyes in combination with other tools in Max, like NURBs patches or Surface Tools.

Third party plug-ins like MetaReyes add great possibilities to 3d Studio Max. If you haven't bought a copy, check out the MetaReyes web site at www.infografica.com. Regardless of the modeling method you prefer, you'll find design and planning are ultimately the most important factors in creating amazing and believable characters.



Figures 1.28 Textures



Figures 1.29 Textures

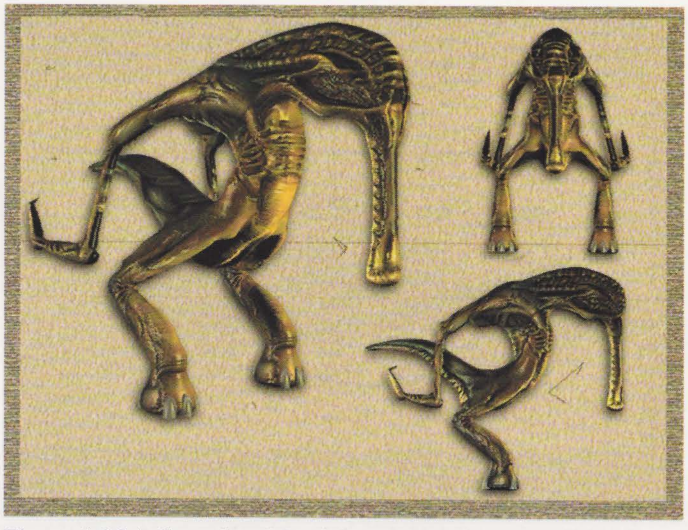


Figure 1.30 A Complete Merrick

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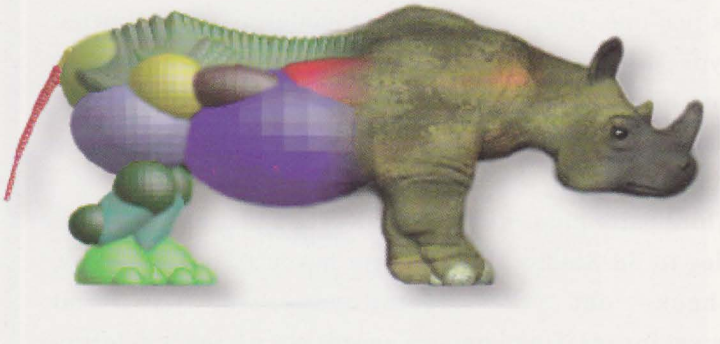

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AnimationMaster

Prehistoric Creature Modeling

By Robert Ward

In this tutorial, we're going to be using Hash's Animation Master to construct a fictional prehistoric creature. Since we're designing the creature for possible export in DXF format, we won't be using Hooks (you can't cleanly export Hooks, so we'll avoid them.) We'll be moving quickly, so referring to the illustrations frequently will help you visualize the modeling process.

Before we begin modeling our creature, we'll need to examine its biography. You can't properly model a creature until you've 'walked in its shoes,' so let's take a close look!

The Creature Biography

We're modeling a fictional Ankylosaur named Sally - Figure 1.1 is an artist's conception sketch of her!

She looks fearsome, doesn't she? Actually, she's a mild-mannered vegetarian with the disposition of a kitten. Sally has only a very occasional hankering for a mouthful of insects or a quick, guilty bite from some other beasts' prey. Sure, those horns look rather fierce, but they're really 'beauty marks' to help our girl attract a mate. Of course they also serve to discourage larger predators, but they're never used as an offensive weapon. The Ankylosaur is a very mild tempered creature that is more interested in eating than anything else. Happily, Sally's teeth are blunt molars. They're primarily used to grind leaves and insects into the paste females feed to their juvenile young.

Take a look at that menacing 'tail-club.' Surely that's a sign Sally has an aggressive side! Nope - take a look around her habitat and you'll see the trees are a bit worn at just about the height of her club - she uses it to mark her territory. Don't underestimate it, though. When threatened, she can use it to bust a few kneecaps!

Now, what about her environment? Sally lives in an arid semitropical environment, subject to sudden and rather harsh weather changes. Her habitat is filled with the dust, dirt and lush plant life typical of the Jurassic period. Since there is a great deal of foliage nearby, Sally's skin is surfaced with colors and patterns that will camouflage her when she backs into the brush to evade a predator. Ankylosaurs like grazing the bottom of swampland, so Sally has a gray-blue belly that blends with the sky when she's viewed from below. Camouflage is important when you're a popular menu choice!

Well, that about does it for our biographical notes. Now

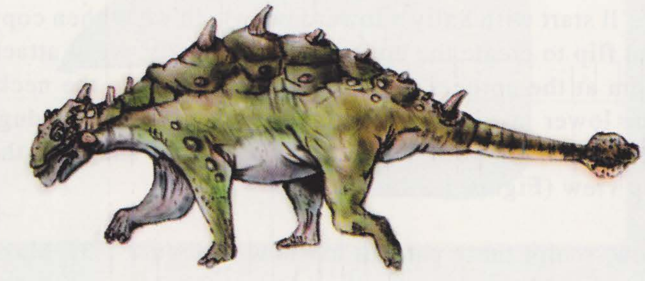

Figure 1.1 Artist's conception of Sally

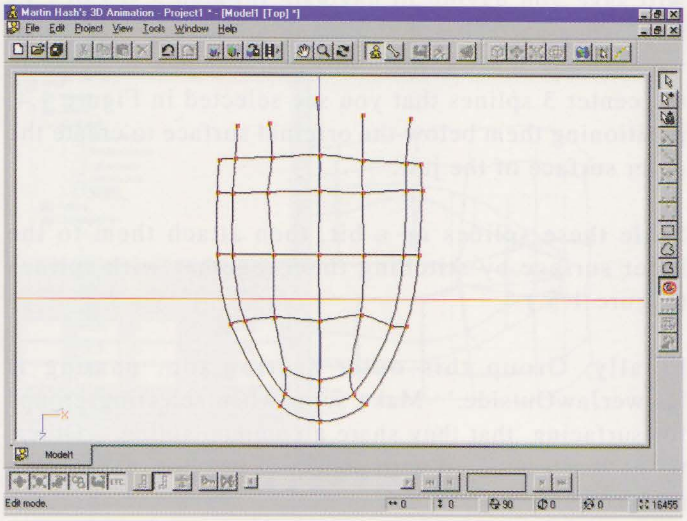
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Figure 1.2 The shape of the lower jaw

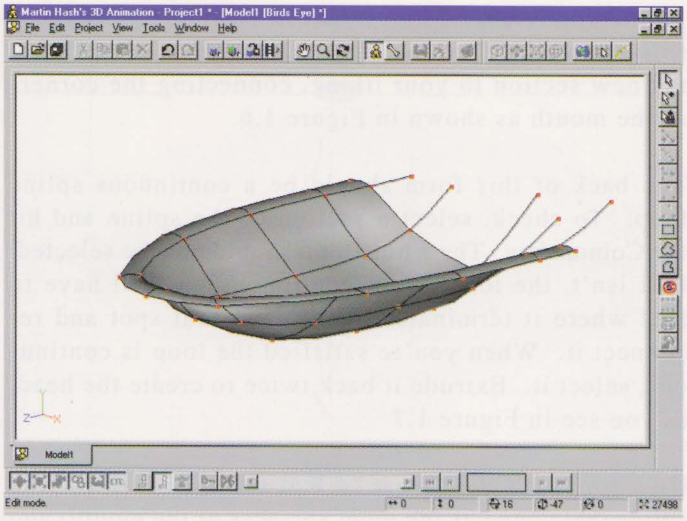
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Figure 1.3 Sculpting the jaw shape

that we 'know' our creature, we're ready to start modeling. We'll begin with the head.

Modeling Sally

We'll start with Sally's lower jaw, which we'll then copy and flip to create the upper section. Finally, we'll attach them at the corners of the mouth and extrude the neck. The lower jaw looks something like the prow of a dug-out canoe, so we'll begin by creating the shape in the top view (Figure 1.2)

Now, sculpt these patches as show in Figure 1.3. Make sure the splines are smooth and graceful. Also, using the right view of the modeling window, keep the CPs of the left and right halves lined up with each other.

Group these splines, naming them 'LowerJawInside.' Creating a Group for just about every element you make will save you having to navigate through a sea of CPs later when surfacing, boning and animating. Now that we have the inner surface of the lower jaw, copy/paste the center 3 splines that you see selected in Figure 1.4, positioning them below the original surface to create the outer surface of the jaw.

Scale these splines up a bit, then attach them to the inner surface by stitching them together with splines (Figure 1.5.)

Finally, Group this outer section too, naming it 'LowerJawOutside.' Make sure, when selecting groups for surfacing, that they share a common spline. Otherwise, you'll wind up with a strip of patches that receive no surface.

To create the upper half of the face, copy and paste this whole structure. Then flip it on the 'Y' axis and position it over the lower jaw. Now you must create new groups for the outer and inner surfaces, such as 'UpperJawInside' and 'UpperJawOutside,' so these splines can have unique surfaced applied. Next, sculpt the new section to your liking, connecting the corners of the mouth as shown in Figure 1.6.

The back of this form should be a continuous spline loop. To check, select a section of the spline and hit the Comma key. The whole loop should now be selected. If it isn't, the loop is not continuous - you'll have to find where it terminates, break it at that spot and reconnect it. When you're satisfied the loop is continuous, select it. Extrude it back twice to create the head, as you see in Figure 1.7

Now to create the throat: select the inner 'ring' (the spline that connects the inner surfaces of the mouth) and extrude it back into the head, as shown in Figure 1.8.

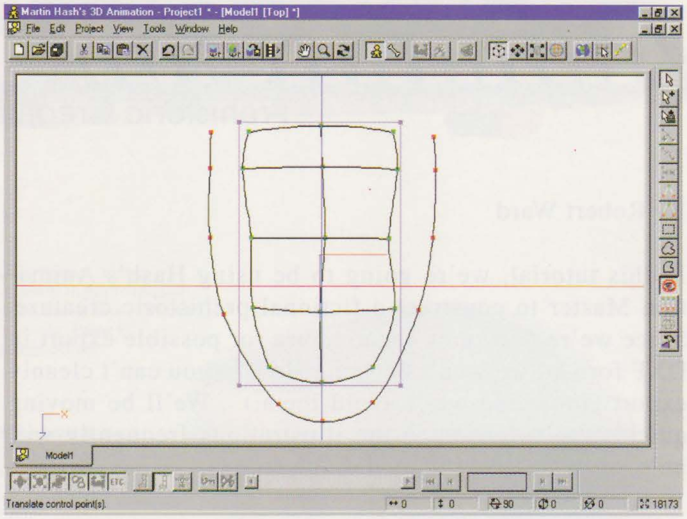
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Figure 1.4 Select a portion to become the outer surface

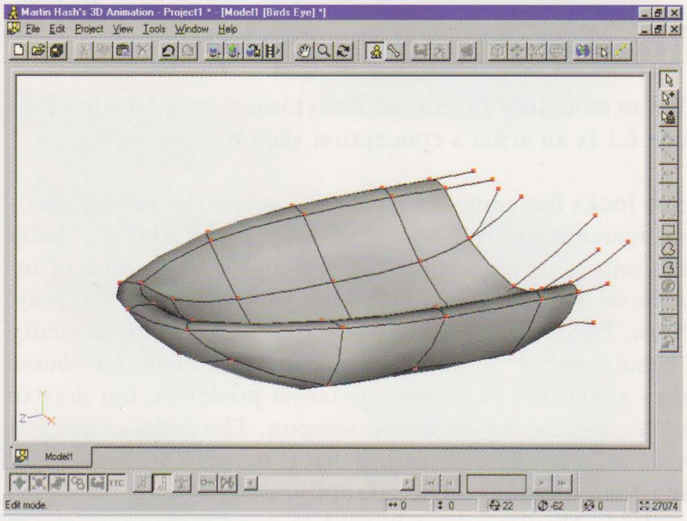
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Figure 1.5 Attaching the lower jaw

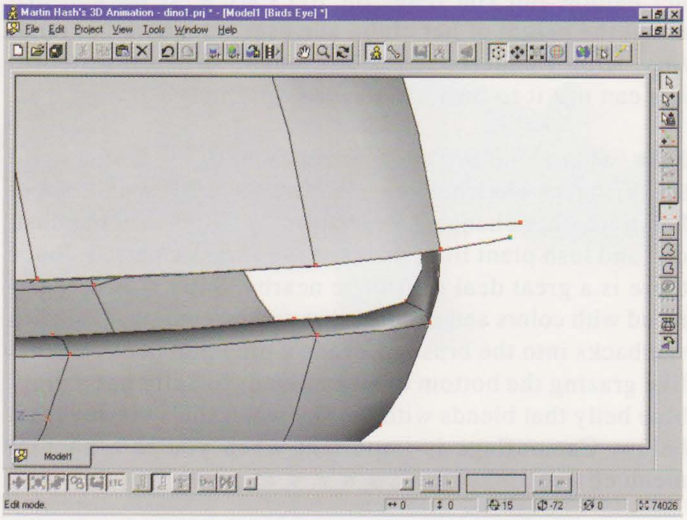
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Figure 1.6 Connect the corners of the mouth

Be sure to group and name this selection `Throat.'

We still need to add Sally's eyes, but those will come later when we build the head armor. For now, let's get her body completed.

Modeling the Body

Sally's body is beefy - imagine her without armor and limbs, and you'll see that she's a perfect candidate for a lathe. To add the limbs, we'll simply cut holes in her sides. Finally, we'll place the armor along her back as separate objects. We'll begin by creating the sexy contour of her body with a single spline in the front view. (Figure 1.9)

Set cross sections to '9' under Tools > Options > Modeling >Lathe Cross Sections, and lathe this spline. Then rotate it into a position relative to the neck and attach them as you see in Figure 1.10.

You'll notice that the neck consists of 10 splines, whereas the body consists of 9. Since we aren't using hooks for this project, we'll simply stitch the extra spline of the neck back into the body and leave a hole, as you see in Figure 1.11.

This is acceptable because Sally's armor will completely hide it. Of course, if we were using Hooks we'd simply add a tenth spline to the head. Now let's create some limbs for Sally.

Creating the Limbs

Before we create the limbs, we'll 'cut' holes in the body where they will be attached. In the Right viewport, arrange the splines so that circles are approximated at the front and rear where the limbs will be placed. Then delete these splines as you see in Figure 1.12.

The circles outlining the holes are not continuous splines, so you'll need to break and reattach them to make them continuous. Again, you can check this by selecting a portion of the spline and hitting the comma key. Figure 1.13 shows what they will look like once you have made them continuous.

We'll extrude these holes into limbs on one side of the body, then copy, flip and attach them to the opposite side. With 8 CPs per loop on the limbs to work with, we'll create some of the muscle definition with CP placement, and some with bias and magnitude adjustment. Go ahead and extrude the limbs down a few times, and begin to sculpt them as you see in Figure 1.14.

You'll want to check these from many angles. Be sure to pay attention to how they 'flow' at the underside into the belly. Continue the process of extrusion and sculpting into the feet, as shown in Figure 1.15.

The bottoms of the feet can easily be made flat by selecting the CPs and scaling them to near zero. Sally is now starting to show some semblance to our sketch! Let's continue, by adding the

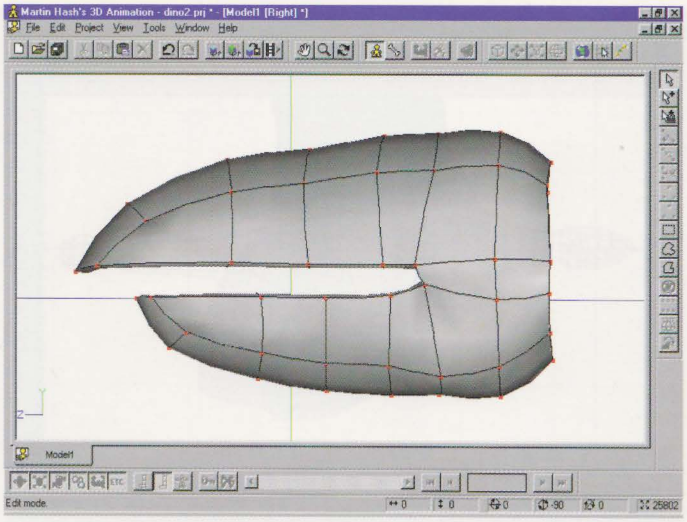
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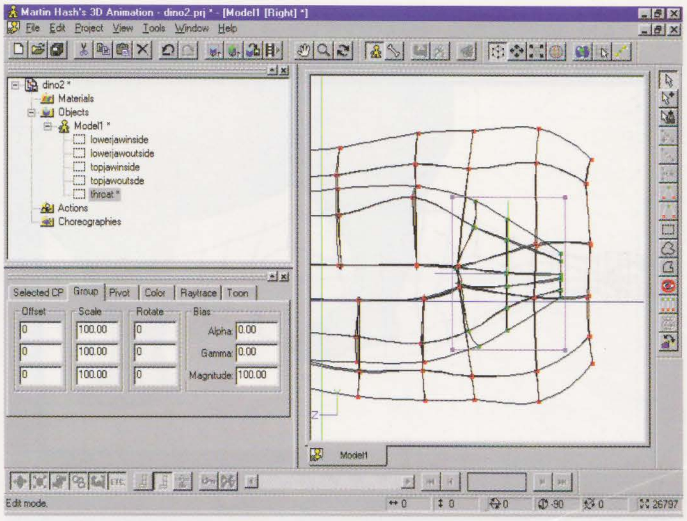
Figure 1.7 Extrude the head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Materials
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Offset: 0, 0, 0
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Figure 1. 8 Extrude the throat

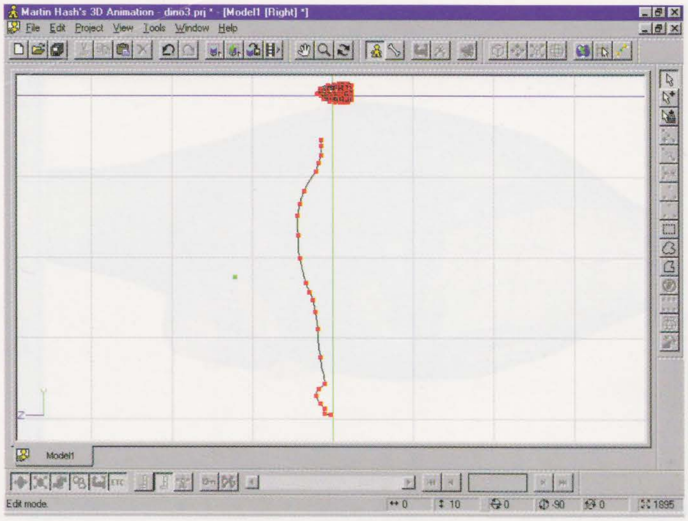
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Figure 1.9 The contour of Sally's body

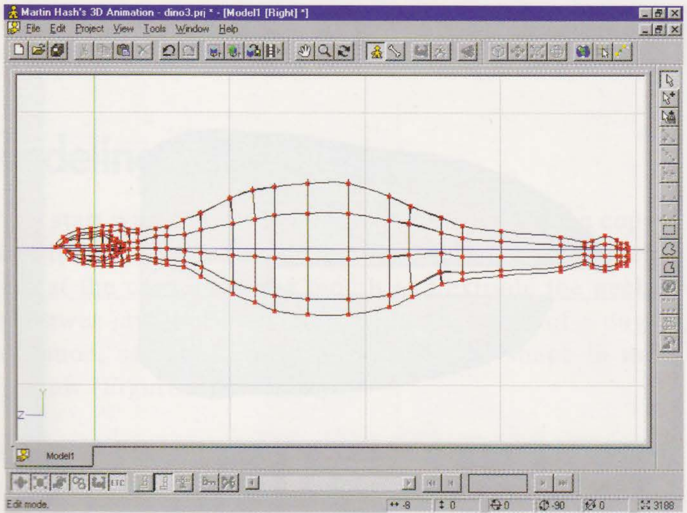
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Figure 1.10 Attach the neck to the body

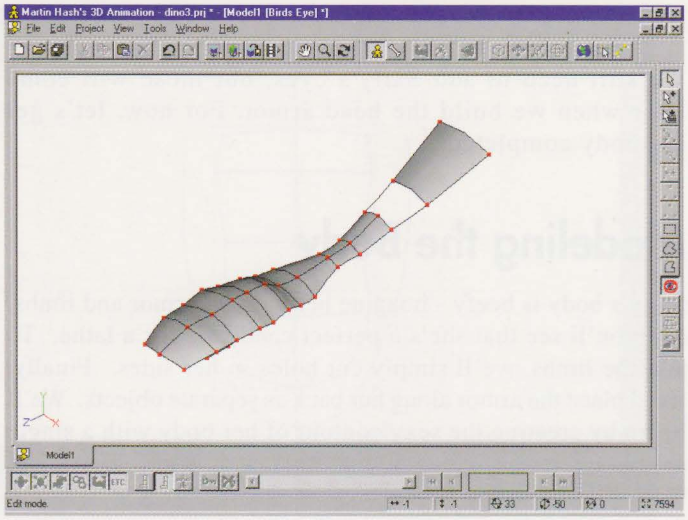
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Figure 1.11 Stitch the extra spline into the body

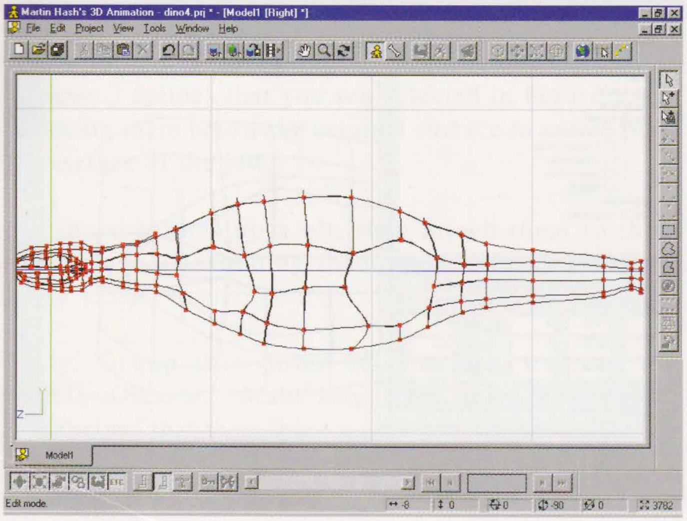
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Figure 1.12 Cut holes for the limbs

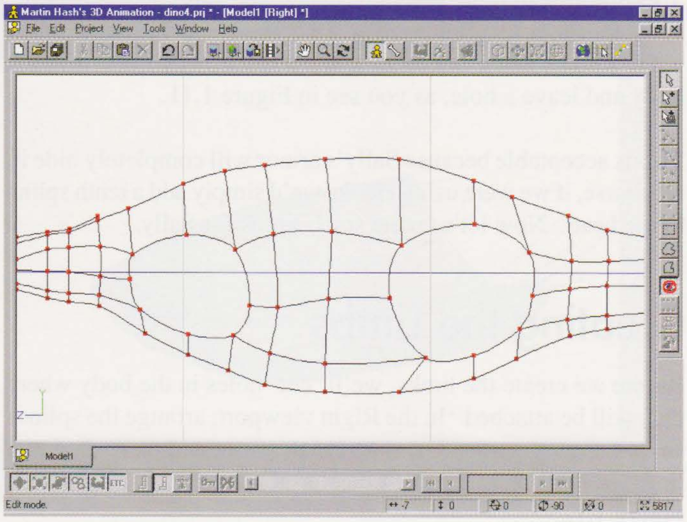
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Figure 1.13 Make the splines continuous around the holes

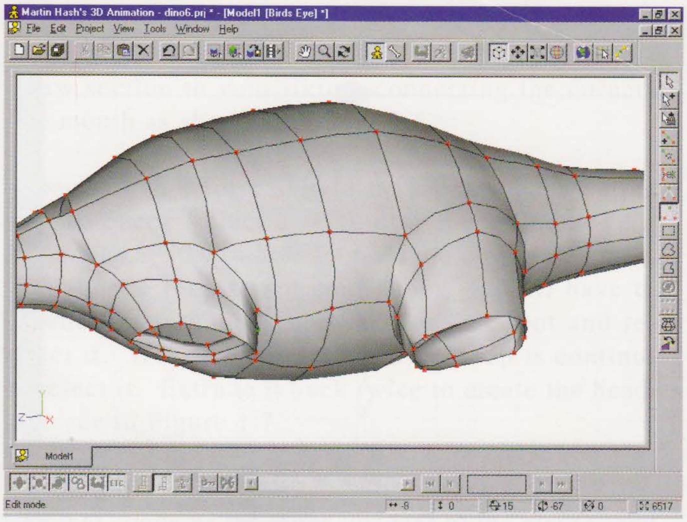
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Figure 1.14 Begin to extrude and sculpt the limbs

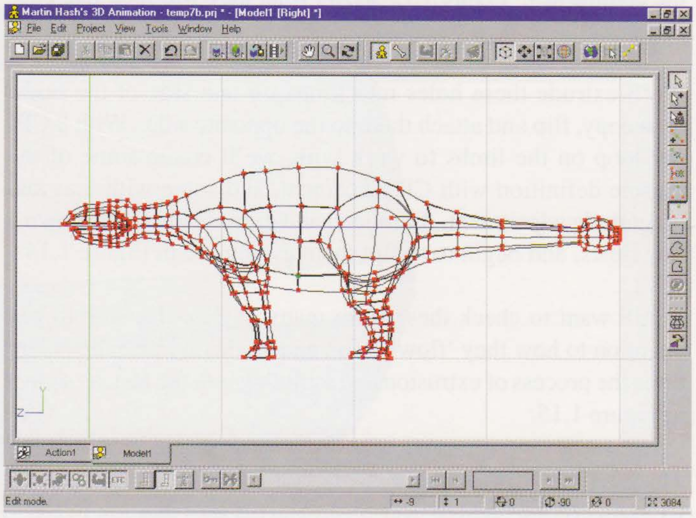
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Figure 1.15 Extrude into the feet

claws to her feet. Remember, she has two claws per foot - we'll need to create sockets for them. We could just 'cram them in there' like most 3D models, but that wouldn't look very realistic. Let's take a look at how we create the sockets.

Modeling the Foot Detail

Creating the sockets is very similar to forming the limbs. Simply cut holes and extrude the details. Go ahead and do this to the feet, as shown in Figure 1.16.

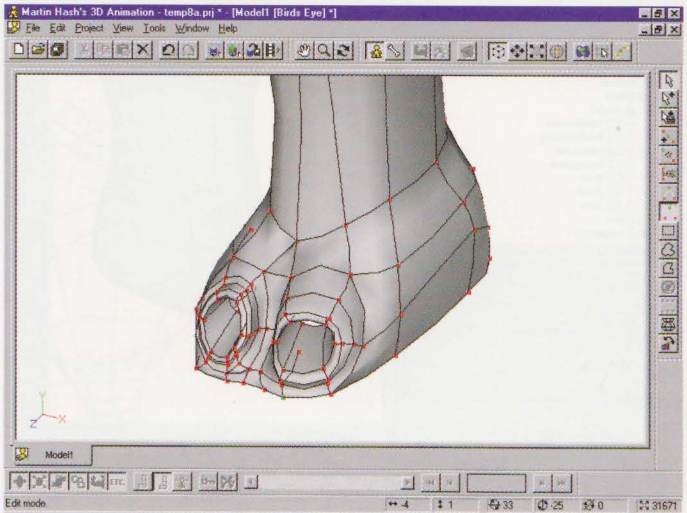
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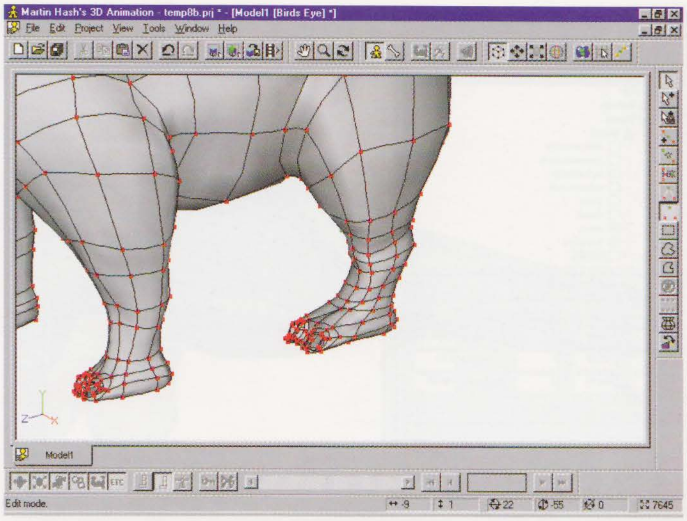
Figure 1.16 Create sockets in the feet

Be sure to note where extra splines have been added, and that the ends of these sockets were extruded back into the feet to create an inner surface. You don't want to simply leave the sockets with a flat surface on the end, since it would be no different than jamming the claw into her foot.
Duplicate this work on the other foot (Figure 1.17.)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Model1
Edit mode.

Figure 1.17 Sockets on both feet

Sally's feet will take some tweaking to get them properly formed. When you are satisfied, copy both limbs, flip them on the 'X' axis, then attach the copies to the holes on the opposite side of the body (Figure 1.18.)

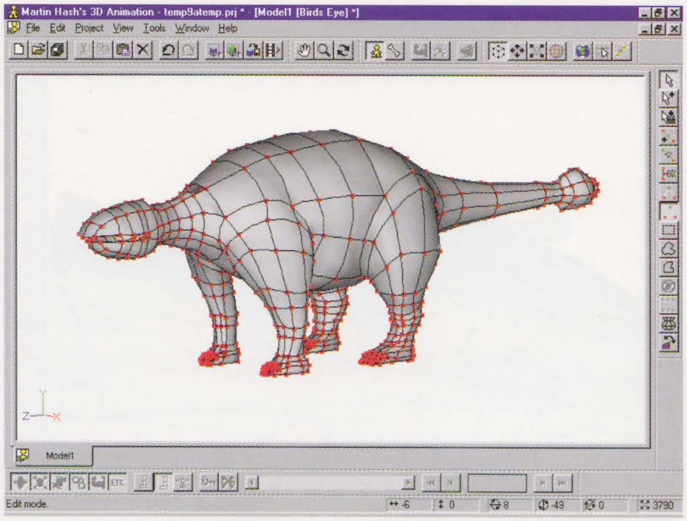
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Figure 1.18 Attach the copies to the opposite side of the body

To complete the feet we'll lathe simple cones, sculpt them into claws, and position them in the sockets as you see in Figure 1.19. Be sure to group these and name them 'Claws' before moving them into place (or you'll have to 'hunt and peck' to find them later.)

OK, now we're ready to move on to creating Sally's armor.

Creating Sally's Armor

Sally's armor consists of the following objects, placed over the body: Head Plate, Horn Socket and Back Plates. We'll begin with the head plate.

The Head Plate

We'll start the head by forming the splines in the Right viewport, as you see in Figure 1.20.

Once you duplicate the spline layout from Fig.1.20, rotate it about and sculpt it in 3 dimensions. This is the left half of the plate. Once you're satisfied, copy and flip it on the 'X' axis. Position the copy, and stitch the two halves together (Figure 1.21.)

In Figure 1.21, the splines outlining the head plate and eye sockets have been grouped, extruded, and scaled down a bit to give it some depth. You'll need to add thickness to a prehistoric creature's skin to make it appear realistic, particularly the armor.

If you refer to our sketch of Sally, you'll see a horn growing from the rear of the head plate. We'll need to

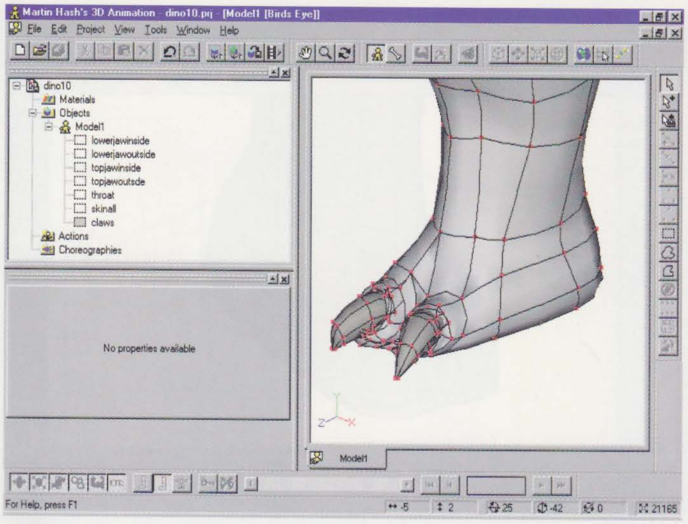
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Figure 1.19 Create and position the claws

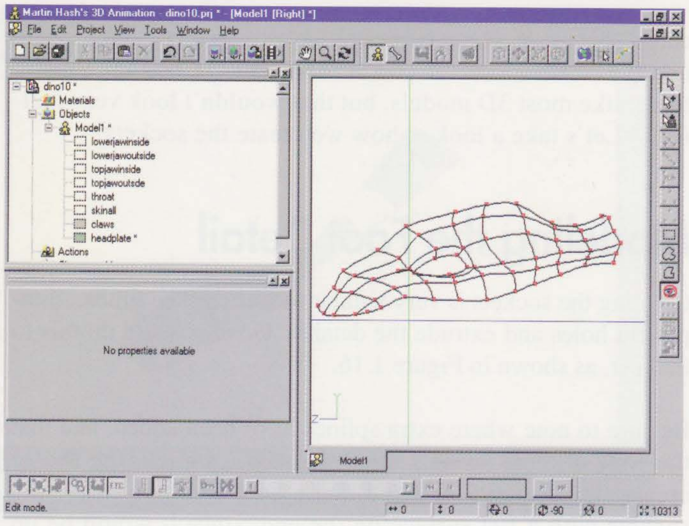
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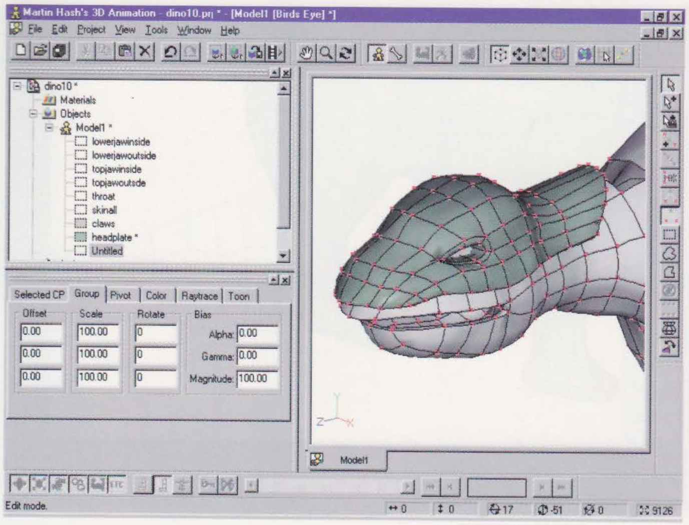
Figure 1.20 Create the right-side of the head plate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skinall
claws
headplate *
Untitled
Selected CP
Group
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Color
Raytrace
Toon
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Figure 1.21 Stitch the two halves of the head plate

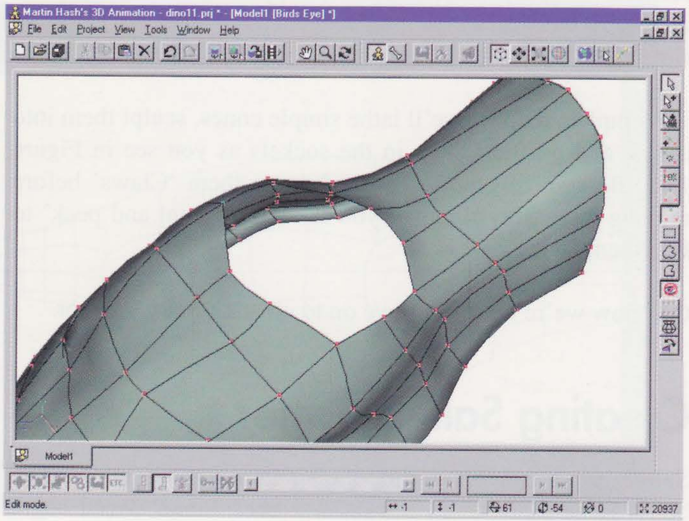
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Figure 1.22 Cut a hole in the head plate for the horn-socket

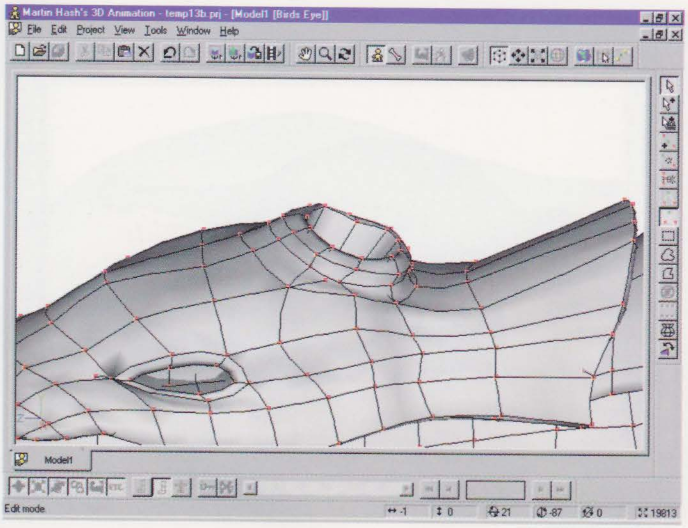
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Figure 1.23 Extrude and sculpt the horn-socket

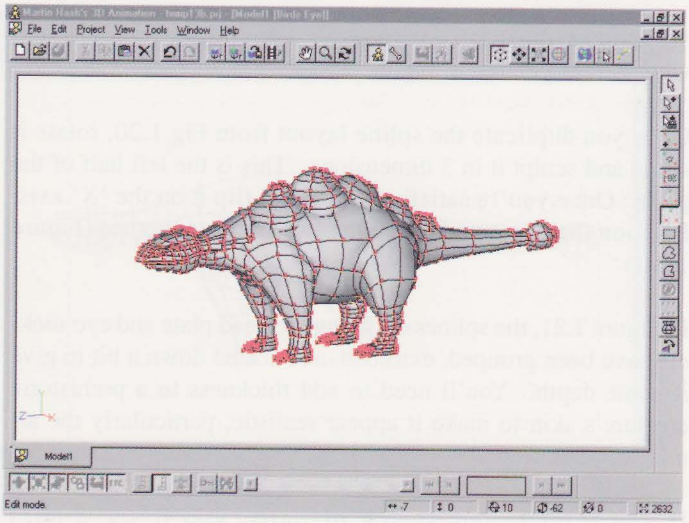
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Figure 1.24 Create the back plates

create the socket for this horn, just as we did for the claws.

The Horn Socket

First, cut a hole by deleting splines where the socket will be placed (Figure 1.22.)

Again, break and re-attach splines to make a continuous loop for extrusion. Now extrude and sculpt the socket as you see in Figure 1.23.

OK, that was simple. Now we'll finish the armor with the back plates.

The Back Plates

The back plates are easy to create. First, start by Lathing an open, vase-like shape. Duplicate it 5 times, positioning the plates and sculpting them, as shown in Figure 1.24.

The socket for the sixth horn (at the base of the tail) will be extruded from the tail patches. We extruded the socket for the head plate in the same way. First, however, let's add a little more 'resolution' to the tail to permit it to bend naturally. The tail now consists of five spline-loops. Eleven should be about right (Figure 1.25.)

This is admittedly 'grunt work' - but that which does not kill us, well ... you know. After adding the spline-loops, add the socket to the base of the tail as shown in Figure 1.26.

Okay, time to fill all those empty sockets with horns. These are simply Lathed and sculpted cones. Create one and make enough copies, giving each the appropriate size and shape, then position them as seen in Figure 1.27.

That about does it for the armor! We'll be doing the bone protrusions on the front legs after we manipulate the bias of the splines to add the muscle details. Let's create the muscle definition right away.

Creating Muscle Definition

To model Sally's muscles, turn on the bias adjuster handle. Tweak the curvature and magnitude on the splines that define muscles, as you see in Figure 1.28.

If you're not familiar with bias and magnitude adjustment, practice a little first: open another modeling window, create a sphere, and play with the values. Use both the adjuster handle and type values into the properties panel. You can also load the dinosaur model, select various splines and examine the values in its Properties panel.

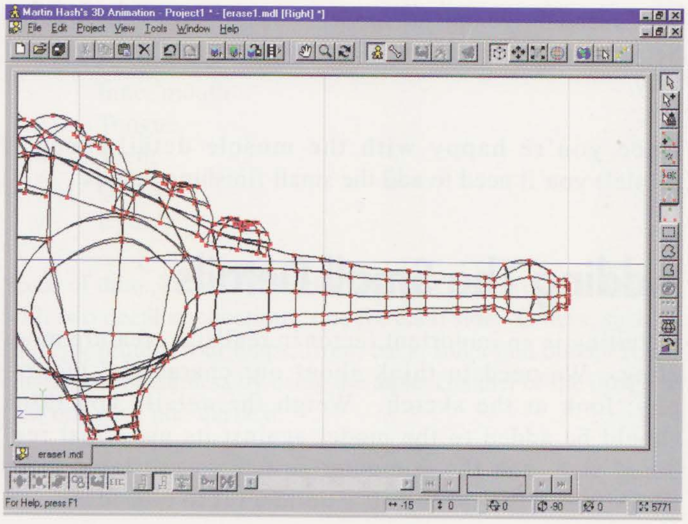
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Figure 1.25 Increase the resolution of the tail

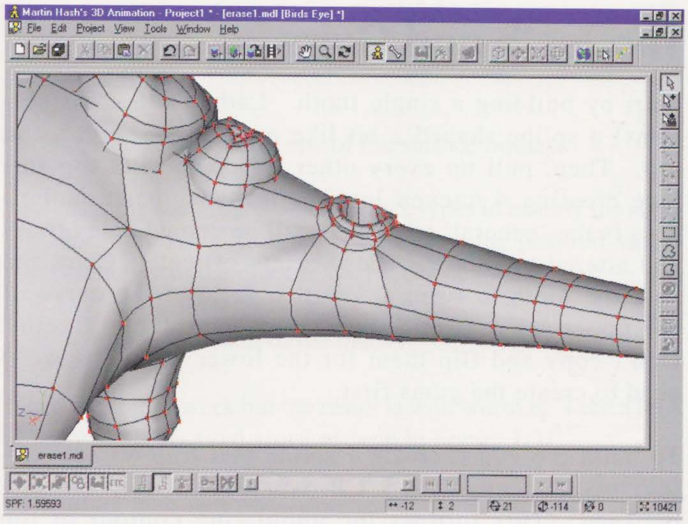
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Figure 1.26 Create the horn-socket for the tail

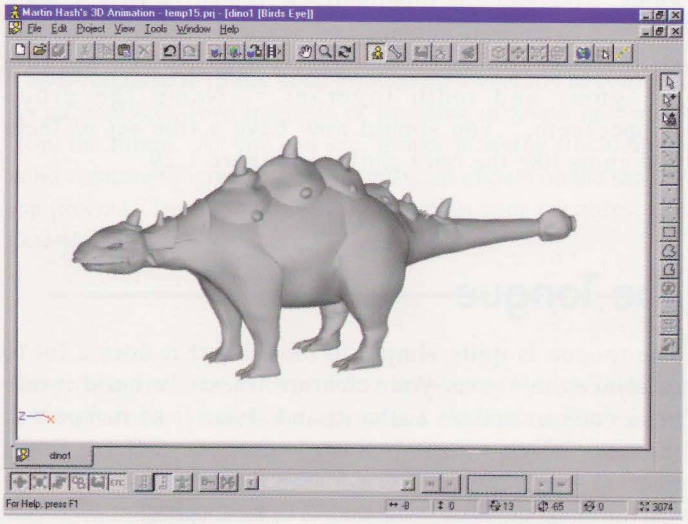
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Figure 1.27 Create and position the horns

You'll find the completed model in the Support section of the Serious 3D web site at http://www.serious3D.com/support/may.

Once you're happy with the muscle detail (keep it subtle!) you'll need to add the small finishing details.

Adding The Small Details

Detailing is an important factor in realistic creature modeling. We need to think about our characters' biography; look at the sketch. Weigh the details you think should be added to the model against its use, final rendered size, and the computer resources available to us (RAM and CPU speed). It's quite a bit to consider.

In Sally's case, we'll be adding some teeth, gums, a tongue, eyes and the bony protrusions on her front legs. Let's step through these.

The Teeth and Gums

Start by building a single tooth. Lathe (at 8 cross sections) a spline shaped a bit like a corn seed with a flat top. Then, pull up every other CP on the flat top surface creating 4 uneven lumps (like your basic molar.) This is the 'general' tooth that will be copied many times and altered to create a wide variety of teeth. Copy and past the tooth to form a row that follows the curve of the upper jaw. Group these, and name them `Teeth.' Don't copy and flip them for the lower jaw yet - we'll need to create the gums first.

To build the gums, create a spline that follows the contour of the teeth with 1 CP over each tooth, and one between. This follows the undulating contour of the teeth as seen from above. Group this spline and name it 'Gums'. Extrude the 'Gums' spline upwards and scale it up a bit. Then extrude them upwards again and scale them down slightly. This is the outer surface of the gums. To create the inner surface, select the first 'Gums' spline. Extrude it upward and scale it down. Now, add all the gum splines to the 'Gums' group, then position the gums and teeth together. Name the group 'UpperTeeth.' You should now have a fine set of teeth and gums like the ones shown in Figure 1.29.

The Tongue

The tongue is quite simple to model, yet it does a lot to convince the viewer your creature lives! To build it create a contour spline, Lathe it, and shape it so it tapers at the tip. Sally's tongue is a big, wet, heavy affair. Don't forget to add the prominent center crease by pulling down the CPs that run along the seam in the middle of the tongue.

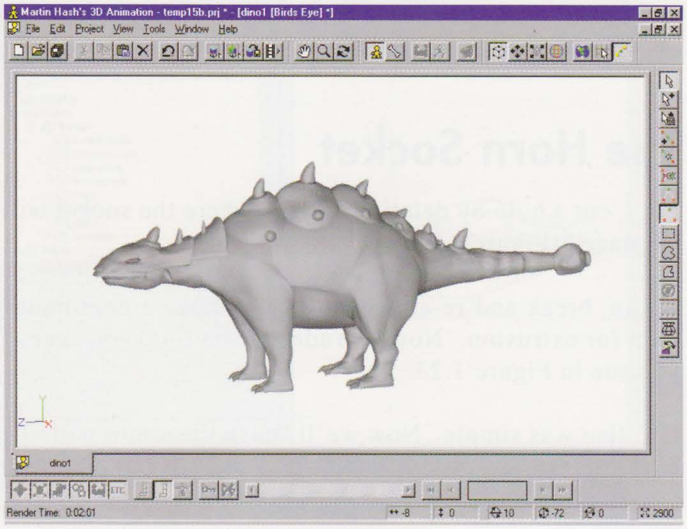
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Figure 1.28 Adjust bias and magnitude

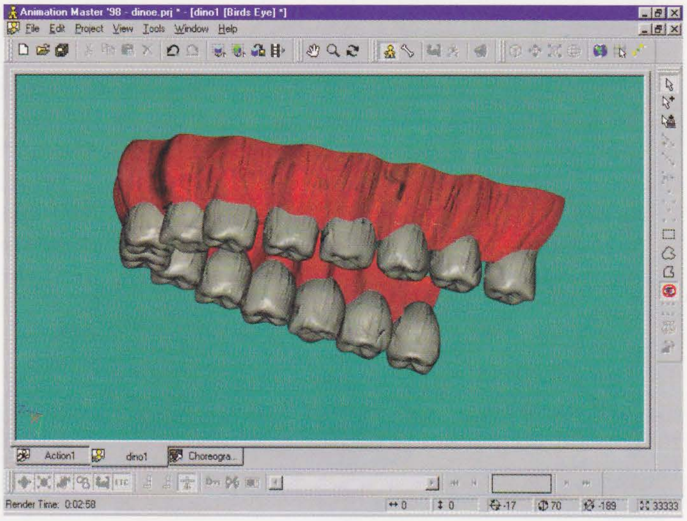
Animation Master '98 - dinoe.prj * - [dino1 [Birds Eye] *]
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Figure 1.29 The teeth and gums

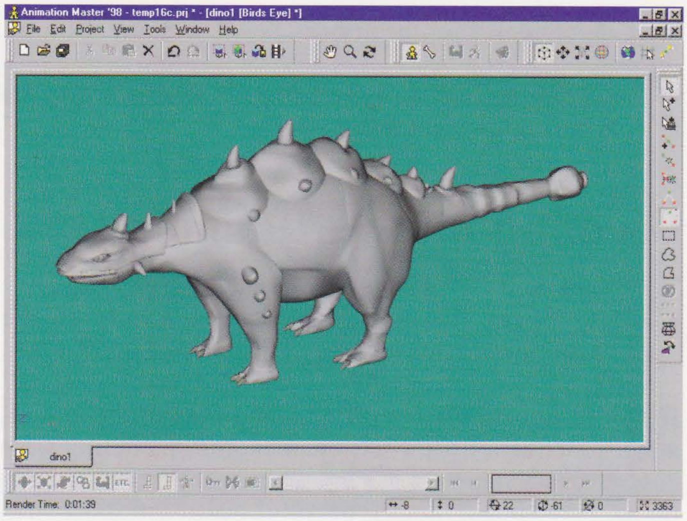
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Figure 1.30 The completed model

a defensive shield, protecting Wally from carnivores. Others maintain that the plates may have served as some sort of temperature control mechanism. We'll be including them, however, because they look cool! Wally has a number of bony spikes on his tail, which are used for self-defense. Believe me, you don't want to near Wally's tail when he's mad!

In its day, the Stegosaurus spread throughout western North America, Europe and Africa. The species died out about 150 million years ago. Fortunately, through the miracles of truespace3 technology, we are able to restore Wally to life. Let's consider how we're going to perform this 'resurrection.'

Begin With the Basics

Every 3D modeler develops an individual style eventually. As you gain experience, you find certain approaches and techniques suit your style. Many find that the basic building block of choice in truespace3 is the 'Sphere' Primitive. You'll doubtless also find that 'Deform Object' is the most useful tool in the TS3 inventory. With the Sphere Primitive, Deform Object, and a little ingenuity, you can create nearly any shape.

To begin our Stegosaurus, we will first create the body from a Sphere Primitive. Before creating the Sphere Primitive, Right-click on the Create Sphere Primitive icon. Set the resolution to 20 latitude and 15 longitude. This will provide you with higher density sphere, which in turn will provide a smooth mesh.

Now click on the icon to create the Sphere Primitive. Scale it fairly large along all three axes so you have something to work with. In Side View, rotate the sphere 90 degrees clockwise. To ensure that the sphere rotates exactly 90 degrees, turn on Grid Snap. This restrains rotation to 45 degree increments - don't forget to turn it back off, though! If you find yourself vainly attempting to move an object that stubbornly refuses to budge, check Grid Snap before you blow an artery. Odds are you've inadvertently left it on.

We now have a sphere to serve as the basis for the body. It's time to begin 'hammering' Wally into shape. To do this, we'll use the Deform Object tool. This is the most useful tool in trueSpace3. When you really understand all its capabilities, you'll wonder why some high-end packages that cost more than your house don't have it. Click on the Deform Object icon. In panel that opens, select the icon that limits deformation to the Z axis. Outside the object, left-click and drag to increase the number of control planes to 20. Still in Side View, begin scaling the height of these control planes to create the basic profile of the body, neck and tail as shown in Figure 1.02.

Switch to Top View - continue to shape the body, by scaling the control planes. If you're unfamiliar with TS3, it may take awhile to appreciate the potential of the Deform

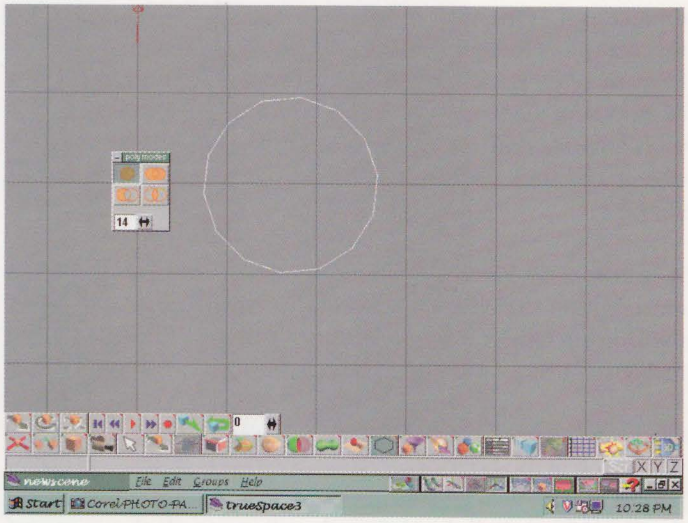


Figure 1.4 Use the Create Regular Polygon tool

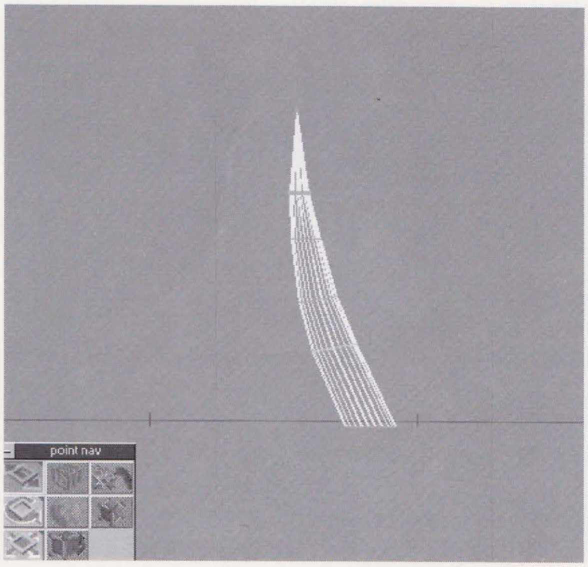
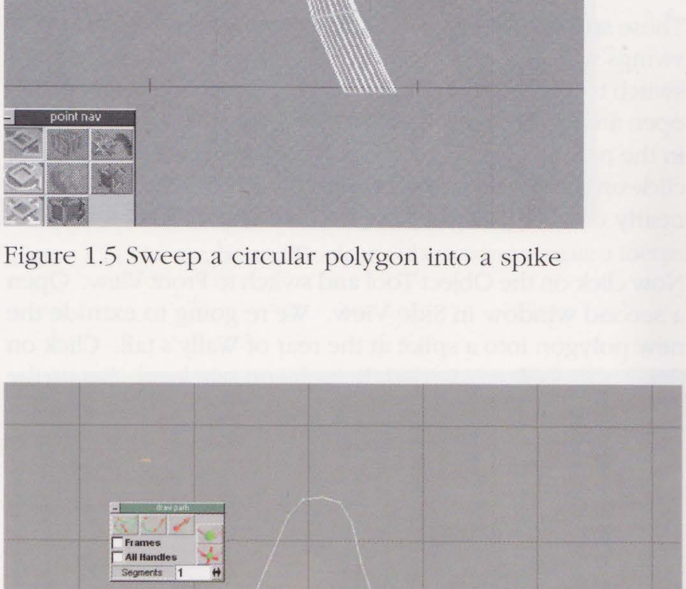


Figure 1.5 Sweep a circular polygon into a spike



☐ Frames
☐ All Handles
Segments 1

Move point, or drag end point of handle (left button: both handles, right: change angle).

Figure 1.6 Use the Draw Spline Polygon tool to create the plates

trueSpace

Prehistoric Creature Modeling

By Darris Dobbs

Nobody said modeling realistic creatures in a 3D program would be easy. No, they say it requires much effort and infinite patience. Well, what do they know? It doesn't always have to be difficult, or complicated. Doing things the easy way is what truespace3 is all about.

Truespace3 is a powerful modeling program - it's capable of creating almost any object you can imagine. The true (no pun intended) beauty of this program is its simplicity and ease of use. The interface is extremely intuitive and user friendly, lending itself more to the methods of an artist than an engineer. It's designed to entice you to stretch, twist and cut the basic primitives.

Let's demonstrate how easy it really is to create lifelike creature models with TS3. We'll walk through the creation of a Stegosaurus (like those seen recently in the movie The Lost World.) Naturally, our dinosaur won't be as complex and detailed as Mr. Spielberg's. For most purposes this degree of realism is unnecessary. That's the point. Few of us have multimillion dollar budgets! That's why we're using trueSpace3! By using it to its full potential, and carefully staging our scenes, we too can achieve truly spectacular results.

The Stegosaurus

Our subject today is a Stegosaurus named Wally (which you can see in Figure 1.1.) Wally is so named because his brain is approximately the size of a walnut. You aren't going to see Wally on Jeopardy. He'd have a hard time on Sesame Street! Wally is an adult male standing approximately 8 feet tall at the hips. He's over 20 feet long, and weighs more than 8,000 pounds. As a Stegosaurus, Wally belongs to the order Ornithischia, which are the bird-hipped dinosaurs. This means that their pelvis and hips are constructed like a bird, rather than a modern lizard.

Stegosauruses such as Wally were plant eaters. Wally has about 100 tiny teeth that he uses to grind leaf and plant matter. He has to consume a lot of vegetation to maintain his ponderous physique. You won't find this guy at a Weight Watchers meeting - maybe at an all you can eat buffet (in the salad bar, of course.) Wally's most familiar features may be the large triangular bony plates that alternate along the length of his back, and the sharp spikes on the end of his tail.

Many paleontologists believe that the large plates served as

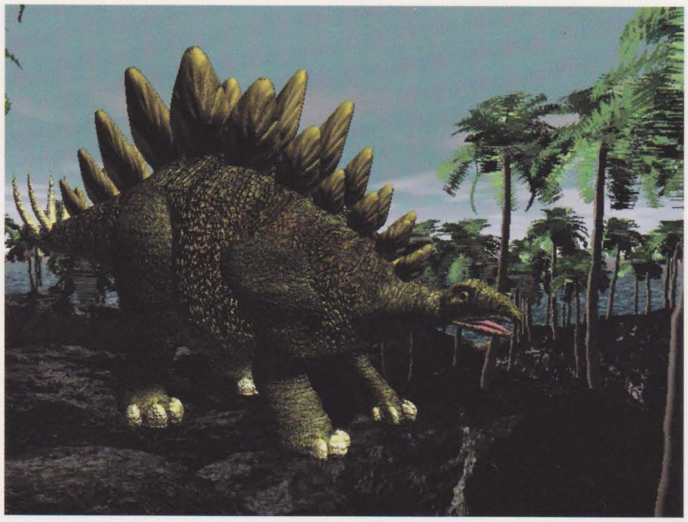
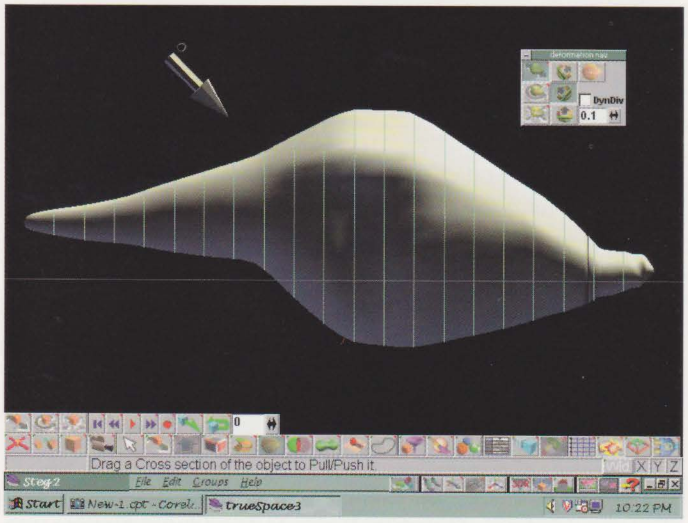


Figure 1.1 A Stegosaurus built in TS3



Drag a Cross section of the object to Pull/Push it.

Figure 1.2 Use Deform Object to transform a sphere into the body

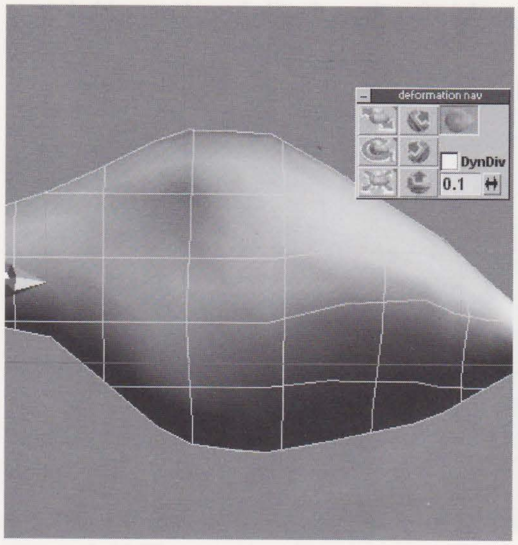


Figure 1.3 Select the intersection vertices where the legs will join

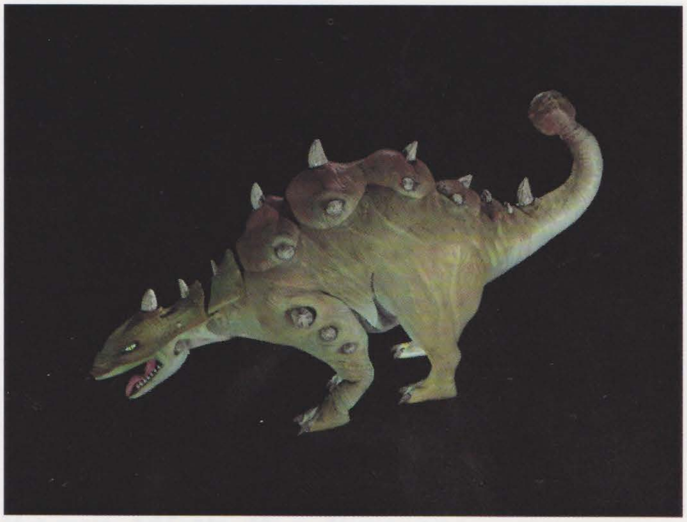


Figure 1.31 Sally in her final glory

The Eyes and Sockets

Sally's eyes are fairly simple to construct. Simply make a closed-loop spline in the Right view, and extrude it out a number of times. This is the outer surface. Keep in mind that a sphere will be seated within it when you create this surface. Creating the inner surface is always important - select the original oval spline, and extrude it back toward the head. Now Group this, naming it 'Eyesocket.' The eye itself is, as you would suspect, a simple sphere.

The Bony Protrusions

The bony extrusions are Lathed half spheres, deformed, then placed in position. They may look a little odd just sticking into her leg like that but we'll use a bump map to create the appearance of horn sockets. Not all details need to be added to the model, particularly when they would be complicated to include. OK, that does it for the details and our modeling work. Figure 1.30 shows the model after these details have been added.

As you can see, we have a fairly realistic and impressive model. Well, it is a bit naked, so let's move on to give Sally some surfacing.

Surfacing Sally

Until Animation Master includes surfacing options such as cubic image mapping, we'll need many decals to cover the mess. Before beginning, I strongly recommend reading the article on Surfacing in this issue by Geoffrey Smith. Many of the techniques discussed for creating seamless surfaces with image maps (decals) are applicable to AM.

Consider the large number of distinct surfaces Sally requires:

- Greenish/brown hide
- White belly and inner legs
- Horns
- Inner mouth
- Tongue
- Teeth
- Gums
- Eyes

Some of these, such as the (relatively flat) tongue can be mapped with two decal applications, one for each side. Others, such as the legs, require four maps: front, back, inner and outer. These can be made seamless by using the alpha channel of the image to fade one edge into the next.

The surfacing process is as follows:

1. Isolate the various sections of mesh and take a screen-capture of each

2. Create the surfaces, (bump, color, specularity, etc.) in your painting application

3 Apply the original snapshot as the first decal to aid in placement

4. Replace this with one of the surface bitmaps

5 Apply each of the other surface types in exactly the same location as the first (copy and paste the position values from one to the other in the proper ties window)

6. Repeat for each of the maps

It can be a bit of work but the result is well worth it. Take a look at Sally in all her final glory, as seen in Figure 1.31.

Often, one map will not 'flow' as nicely into the next as you wish. When this occurs, you'll have to go back to your paint application and fix these little problems. Don't worry. It's really not that bad once you get the hang of it.

Wrap Up

There you have it. Sally is all prettied up and ready to confront social conflicts, love interests or invading dinosaur collectors from the future. As you can see, proper planning (including a solid creature biography) has a significant impact on the modeling process. Invest that bit of time to plan your creatures, and definitely keep on modeling!

Robert is a freelance artist residing in Newton, MA, specializing in 3D character design and animation. He holds a Bachelor of Music degree in Music Composition from Boston University and is an Expert user of Animation Master and LightWave. Robert is a contributing author of "3D Creature Workshop" published by Charles River Inc.

Object tool. One way of interpreting what we can do with this feature is to compare it to the 'skinning' feature common to many other packages. Skinning consists of creating a series of shapes for the top, front and side and then covering the shapes with a mesh skin. With Deform Object, you begin with an object and then use the control planes to alter its profile or shape.

Return to Side View. With Deform Object still active, hit the erase button to delete the current deformation grid. Re-select the Deform Object icon, and create a new grid like that shown in Figure 1.3.

Click on the grid intersection at the point where the foreleg will attach at the bottom of the body. This will place a control handle at the intersection. OK, now open a second window in the Top View. Pull the deform handle towards the center of the object, then upward creating a depression. Do the same with the two intersections directly above it. You should now have a depression for the foreleg to fit into, and also a slight ridge, to simulate the shoulder. Repeat this process at the back of the body where the hind legs will join. This latter depression should be more clearly defined and deeper than the front.

We now have the body, neck and tail of our stegosaurus. It's time to begin adding detail to Wally. We'll start with the spikes on his tail.

The Spikes

These spikes are large, sharp, formidable weapons that Wally swings with devastating force. To begin creating the spikes, switch to Top View (use 'Eye Move' so you are looking at an open area of the grid.) Click on the Regular Polygon tool and in the panel that opens, set the number of sides to 14. Next, click on the screen and drag a small circle. This will create a nearly circular polygon, like the one shown in 1.4.

Now click on the Object Tool and switch to Front View. Open a second window in Side View. We're going to extrude the new polygon into a spike at the rear of Wally's tail. Click on the Sweep tool to extruded the polygon one level. Rotate the active polygon a few degrees, scale it slightly smaller in all directions, and move it outward and back. Sweep the object three more times, making minor adjustments each time. Then, click on the Tip tool so the top polygon will be swept to a sharp point, as shown in Figure 1.5.

Move the spike we've just created into position at the back of the tail. Make a copy, mirror it and move the new spike into position beside the first. Next, copy both spikes and move them forward so there are four spikes on the end of the tail. With the spikes in place, we're ready to move on to the most recognizable feature of Wally, the plates along his back.

The Plates

These plates are relatively simple to create. In Top View,

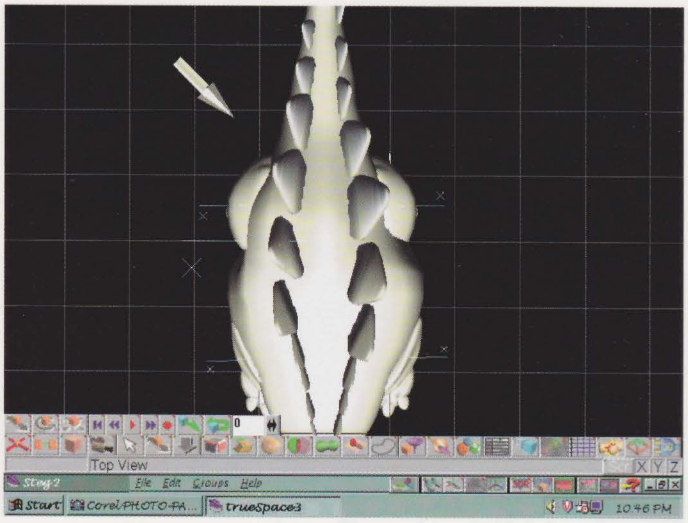


Figure1.7 Arrange the plates in an alternating pattern

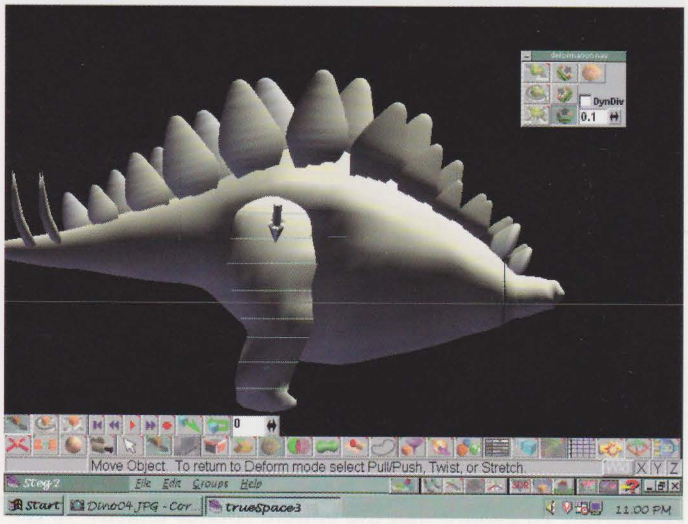

Move Object. To return to Deform mode select Pull/Push, Twist, or Stretch.

Figure 1.08 Deform a sphere into the rear leg

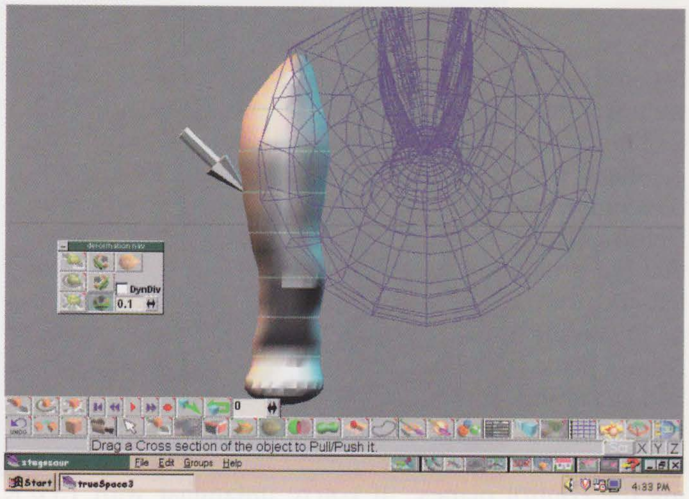

Drag a Cross section of the object to Pull/Push It.

Figure 1.9 Continue to deform the leg in Front View

use the Draw Spline Polygon tool to draw the basic shape, a flat-bottomed diamond with rounded corners wider. It should be wider at the bottom than at the top (Figure 1.6).

Next, use the Sweep tool to extrude the polygon into a thin plate. Move it into its position along the back. Copy the plate, move the duplicate into position beside the first one, and mirror the copy. Contrary to popular depiction in books, cartoons and movies, these plates were not parallel. Rather, they alternated from side to side. Thus each duplicates you make should be moved so that the alternating plates are staggered. Continue to duplicate the plates, scaling the copies appropriately as you position them along Wally's back, as shown in Figure 1.7.

OK, now we're ready to give Wally mobility by adding his legs.

The Legs

To do so let's return to our basic approach, using a Sphere Primitive and Deform Object. In Side View, create a Sphere Primitive. Move it to the rear leg position, and scale it to be about half as narrow as it is long. Now, click on the Deform Object tool. Select the icon that constrains deformation to the control planes perpendicular to the Z axis (Deformation Navigation panel.) Create a deformation grid along the Z axis consisting of eight levels. Then, scale and move the control planes to create the basic shape of the leg shown in Figure 1.8.

Now switch to the Front View. There, continue scaling and moving the control planes until you are satisfied with the leg's shape. When finished, you should have a leg like the one in Figure 1.9.

Now we need to add some taper to the leg. Switch to the Top View. Keep the Deform Object tool selected. Switch to deforming along the Y axis, and scale the leg so that it tapers toward the front and is wider in the center. Finally, rotate and move the leg into the proper position, shown in Figure 1.10.

To finish the leg, we need to add toenails. Start by creating a Sphere Primitive and scale it to an appropriate size. Then create a Cube Primitive, and position it so to bisect the sphere as shown in Figure 1.11.

Boolean Subtract the cube from the sphere, leaving a hemisphere. Then, create another Cube Primitive, bisecting the hemisphere. Boolean Subtract the cube from the hemisphere. The remaining shape is our basic toenail. Save this object as toenail.cob. At this point, it would be a good idea to paint the toenail object a unique color. Later, when surfacing the creature, we can simply use the Paint Over tool to give it a different surface than the leg.

Now position the toenail object on the foot. Then, copy the toenail, positioning the copies until your leg has four

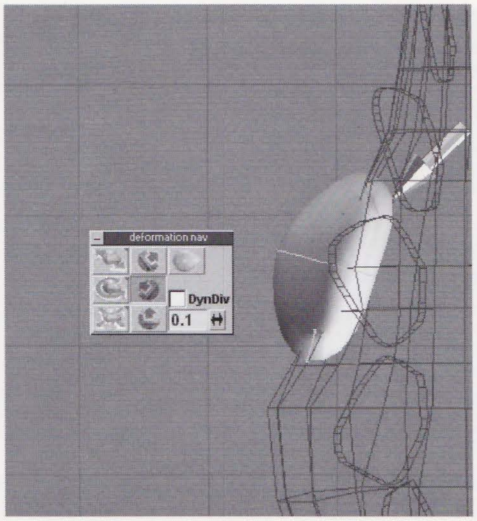


Figure 1.10 Position the leg properly

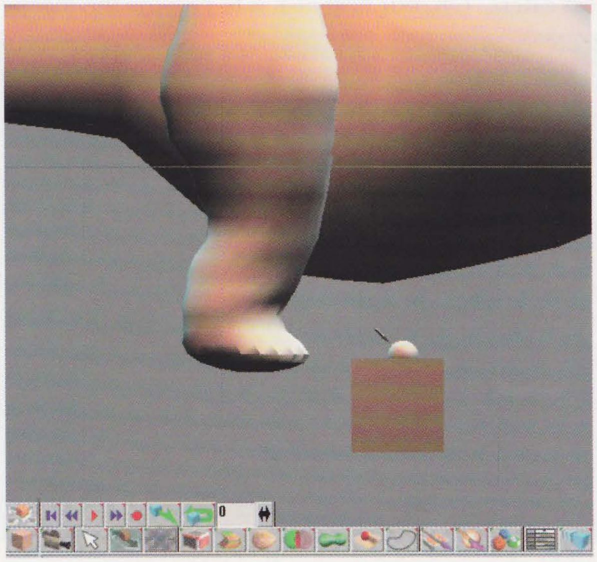
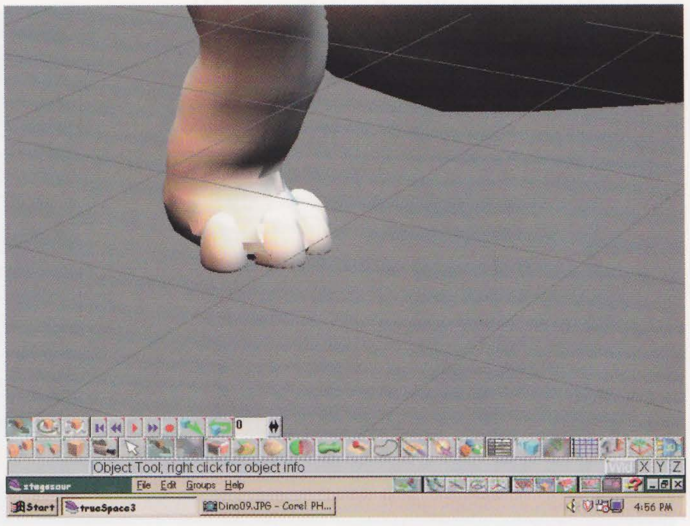


Figure 1.11 Use a cube and Boolean Subtraction to create a toenail



Object Tool; right click for object info

Figure 1.12 Add the toenails using Boolean Addition

toenails. Use Boolean Addition to make the toenails part of the leg as shown in Figure 1.12.

Copy the leg, move it into position on the opposite side of the body, and mirror it. We should now have two rear legs. See Figure 1.13.

Now we need the front legs. Creating the front leg is basically a repeat of the same process used to create the rear leg. Begin with a Sphere Primitive, and use Deform Object in Side View to obtain the basic shape shown in Figure 1.14.

Switch to Front View, and continue deforming the object until it resembles Figure 1.15.

Once the front leg is formed, load the toenail object and add the toenails. Finally, position the leg and copy it. Mirror the copy and move it into position on the opposite side of the body. Wally now has the traditional four legs. This will make it much easier to browse the foliage and avoid those nasty meat eaters. OK, our next task is to provide the receptacle for poor Wally's walnut-sized brain.

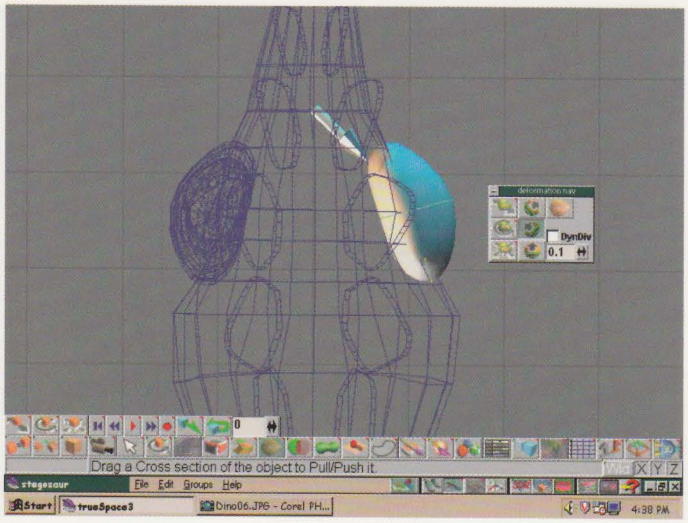

Drag a Cross section of the object to Pull/Push it.

Figure 1.13 Create a copy of the leg and mirror it on the opposite side

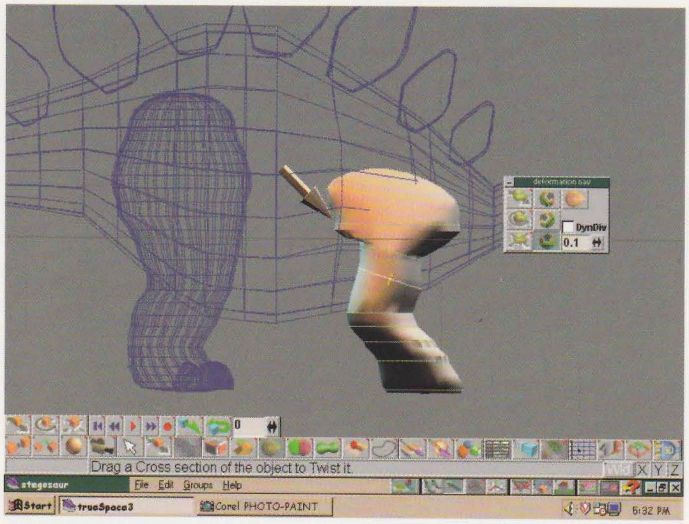

Drag a Cross section of the object to Twist it.

Figure 1.14 Use Deform Object to shape the front legs

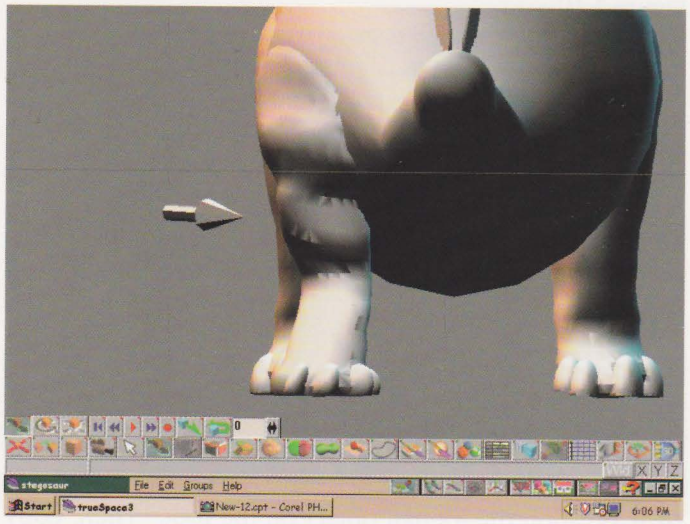


Figure 1.15 Continue shaping the leg in Front View

The Head

Poor Wally, saddled with a brain the size of a walnut ... still, we'll do our best to model a handsome cranium for our dim-witted pal. If you can't have brains, you've got to have looks.

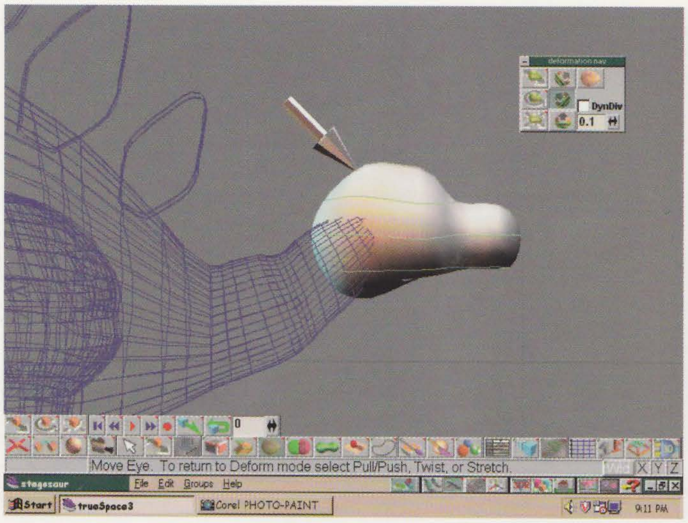
To create the head, again begin with a Sphere Primitive. Hey, I told you this was simple! Now, scale the new sphere to approximately the size of the head. Rotate it ninety degrees clockwise as seen in Side View. The next step is going to come as a big surprise, I'm sure. Use Deform Object to create the basic shape. Begin by deforming along the Z axis to create the basic shape of the head and muzzle. Then, switch to deforming along the Y axis. Select the bottom of the head object. Pull it upwards, and rotate it counterclockwise ten degrees. This creates a slight concavity in the bottom of the head object. This is where we'll fit the mouth and lower jaw. You should now have an object similar to the one in Figure 1.16.

Wally needs some eye sockets. Select the Sculpt Object tool, and click in the appropriate position for the eye. In Top View or Front View, pull the control handle inward to create a cavity. In Side View, manipulate the handles until the cavity is the appropriate size, as shown in Figure 1.17.

With the eye sockets created, we're going to finish shaping the upper portion of Wally's head. In Side View, create a new deformation grid as shown in Figure 1.18, and deform it to match the illustration.

Next, switch to Top View and continue shaping the head. The round eye sockets will now have been deformed into the perfect shape, as shown in Figure 1.19.

To create nostrils, create a Cylinder Primitive, switch to Front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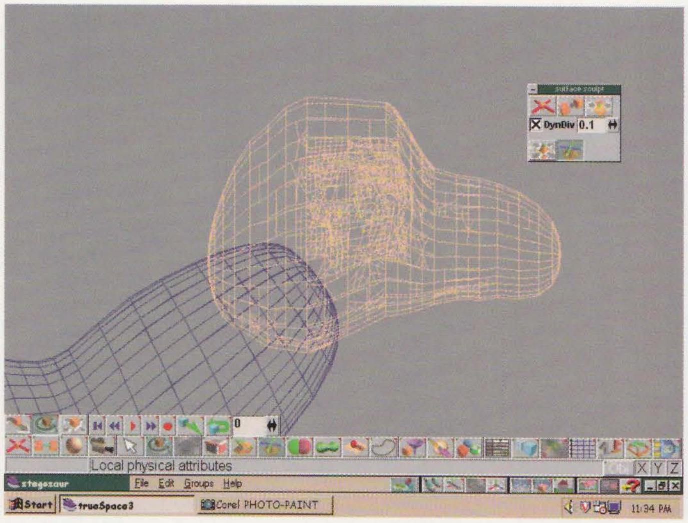
Move Eye. To return to Deform mode select Pull/Push, Twist, or Stretch.

Figure 1.16 Raise and rotate the bottom control plane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Local physical attributes

Figure 1.17 Use Sculpt Surface to create eye sockets

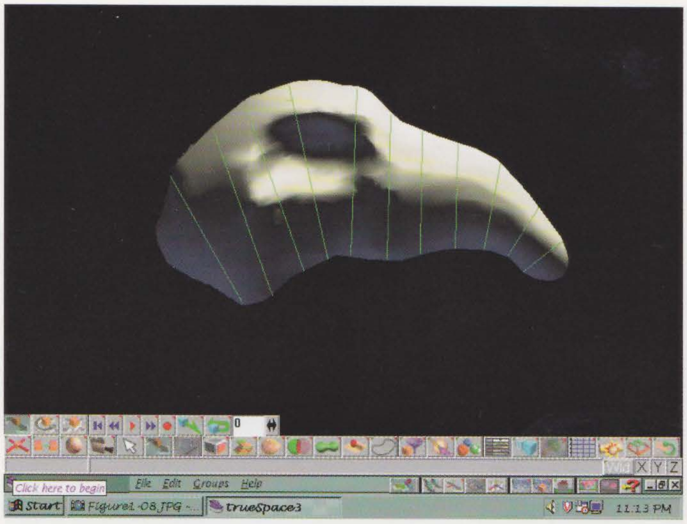
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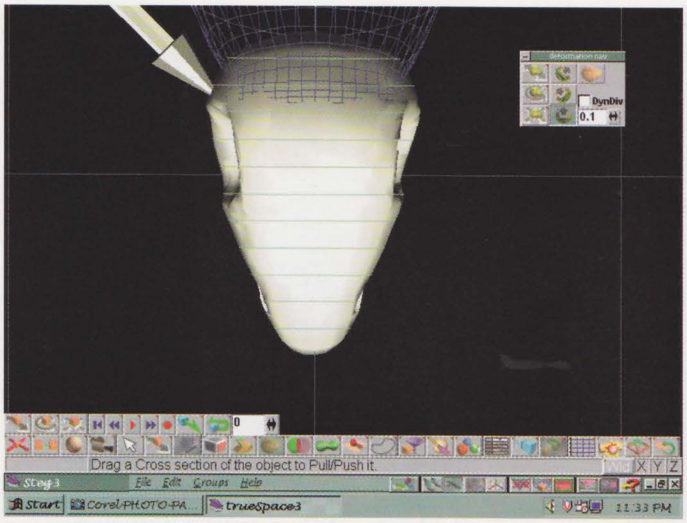
Figure 1.18 Deform the head as shown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Drag a Cross section of the object to Pull/Push it.

Figure 1.19 Finish shaping the head in Top View

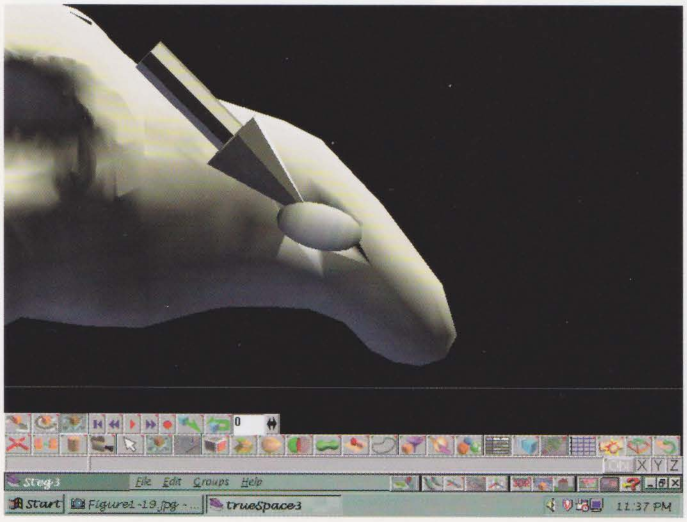
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Figure 1.20 Create and position a cylinder

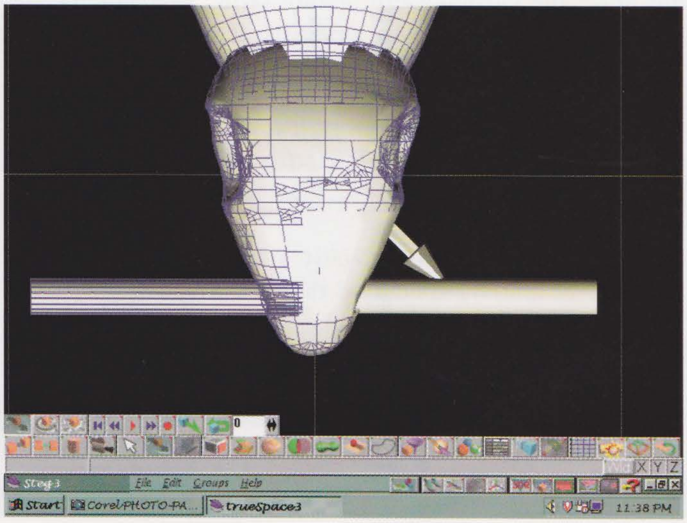
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Figure 1.21 Place the duplicate beside the original

View and paint it a very dark green color. Then, scale it and position it as shown in Figure 1.20.

Position the cylinder as shown, copy it and move the duplicate to the right as shown in Figure 1.21.

The next step is to select our head object, and use Boolean Subtraction to remove the two cylinders from it. This will leave you with two perfectly good nostrils, just like the ones shown in Figure 1.22.

Now Wally needs eyes. The eyes are nothing more than (you guessed it) spheres. Is this simple, or what? 3D modeling doesn't have to be complicated. Create the spheres, scale them and position them in the eye sockets. Then, rotate each of the eyes so the top of the sphere points to the side. You'll see the reason for this when we begin surfacing. See Figure 1.23.

To create the mouth, I'm going to let you in on one of my favorite sneaky secrets. We're going to create a mouth using only a Sphere Primitive that can be animated using the Deform Object tool. Start with a sphere and select Deform Object. Then, create a six level deformation grid along the Y axis and scale the control planes so that your object resembles the illustration in Figure 1.24.

Now pull the top of the sphere down, to create a concave depression. Save this object as mouth.cob. Once you have saved the mouth object, delete the current deformation grid and create a new grid along the Z axis that has six levels.

The next part is a little tricky. Picture your object as a pancake. Your objective is to fold the pancake in half. This requires quite a bit of manipulation, moving and rotating the control planes. When you're finished, your object should resemble Figure 1.25.

If your object becomes too mangled, simply delete it and reload the mouth.cob object. It's essential that you do not erase the current Deformation Grid. By moving and rotating the control planes along the Z axis, you can create completely lifelike animation of the mouth. It isn't easy, but you can achieve excellent results far quicker than with any other method. Figure 1.26 shows how the mouth can be manipulated for animation using the Deformation Grid.

The next step in creating Wally's head is to give him a tongue. Scientists speculate that the Stegosaurus probably used his tongue much like a modern cow or horse, wrapping it around vegetation and using it to help pull plant matter into his mouth. Our tongue is simply a sphere that has been rotated 90 degrees clockwise in Side View. It's then scaled and deformed into appropriate size and shape, as shown in Figure 1.27.

There you have it! Wally can now see, smell and eat

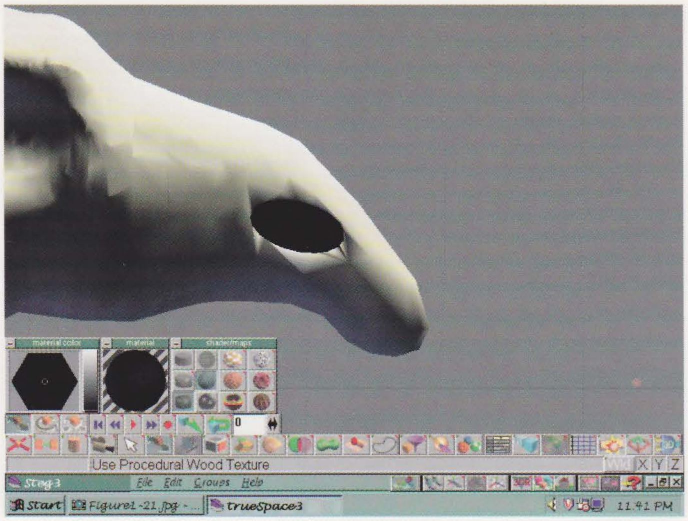

Use Procedural Wood Texture

Figure 1.22 Boolean subtract the cylinders to create nostrils

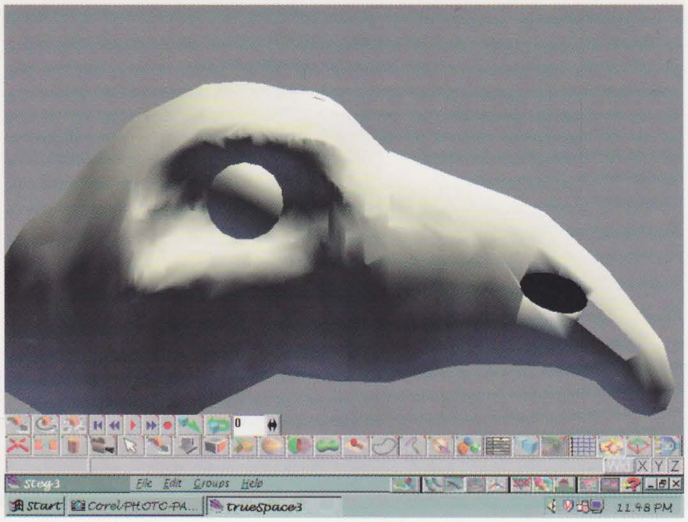


Figure 1.23 Position the eyeball spheres with their tops pointing straight out to the side

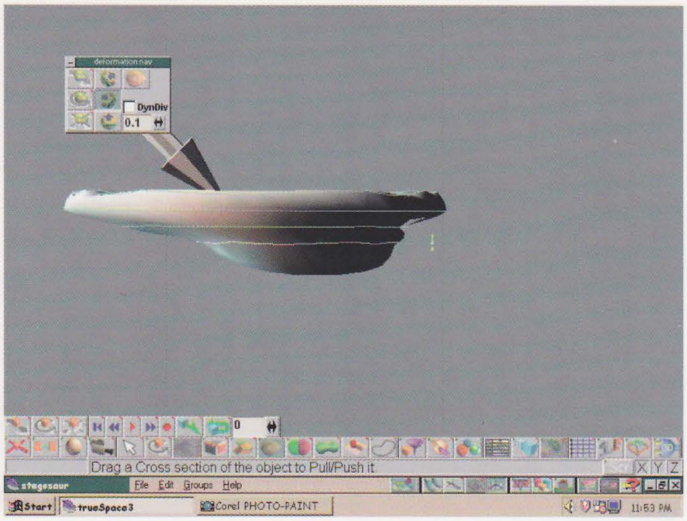
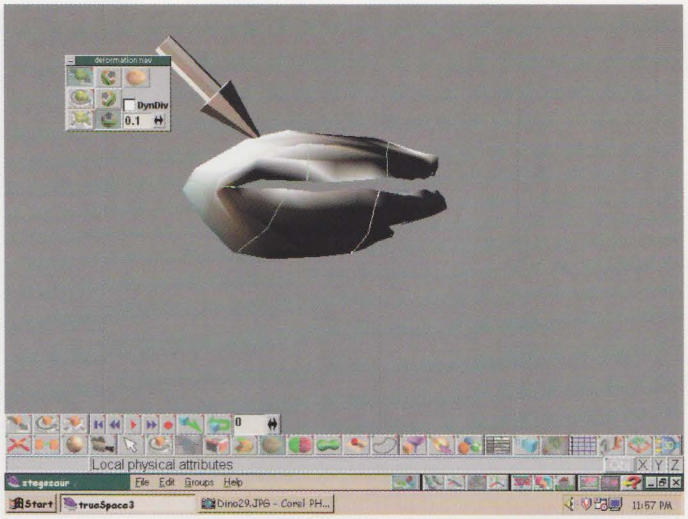
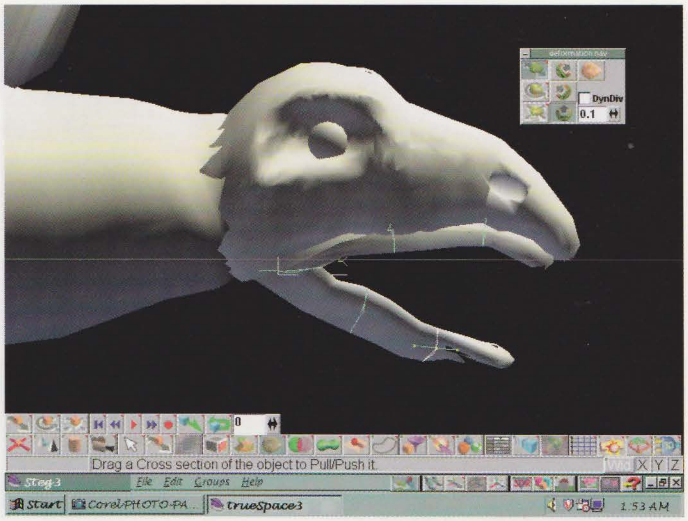

Drag a Cross section of the object to Pull/Push it

Figure 1.24 Deform the sphere as shown


deformation nav
DynDiv
0.1
stegosaur
File Edit Groups Help
Start
trueSpace3
Dino29.JPG - Corel PH...
11:57 PM

Local physical attributes

Figure 1.25 Fold the object over


deformation nav
DynDiv
0.1
Steg-3
File Edit Groups Help
Start
CorelPHOTO-PA...
trueSpace3
1:53 AM

Drag a Cross section of the object to Pull/Push it.

Figure 1.26 You can animate the mouth by moving and rotating the control planes

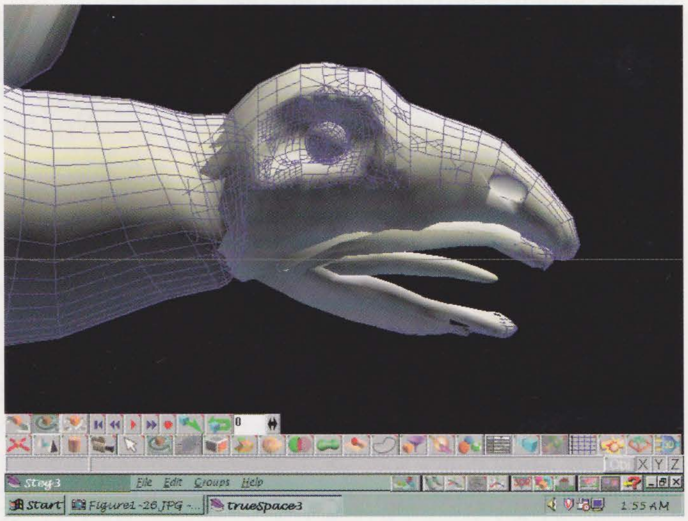

Steg-3
File Edit Groups Help
Start
Figure1-26.JPG -...
trueSpace3
1:55 AM

Figure 1.27 Mouth in place with tongue added

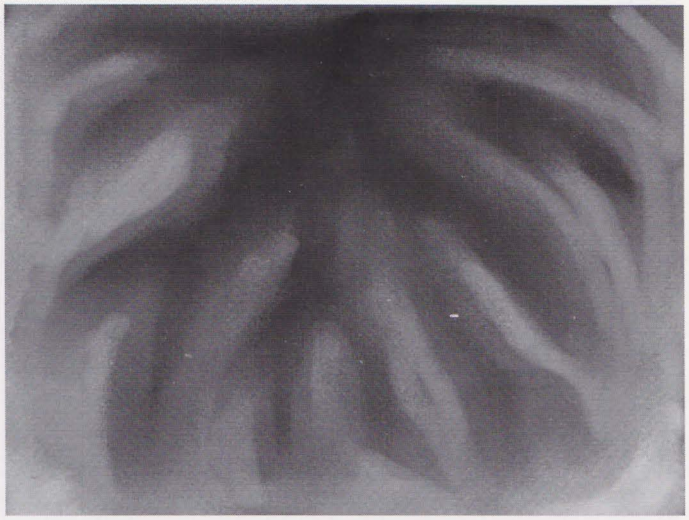


Figure 1.28 The plate texture

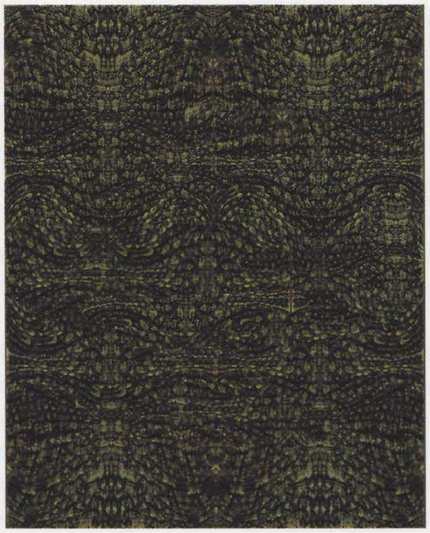


Figure 1.29 The hand painted leg texture

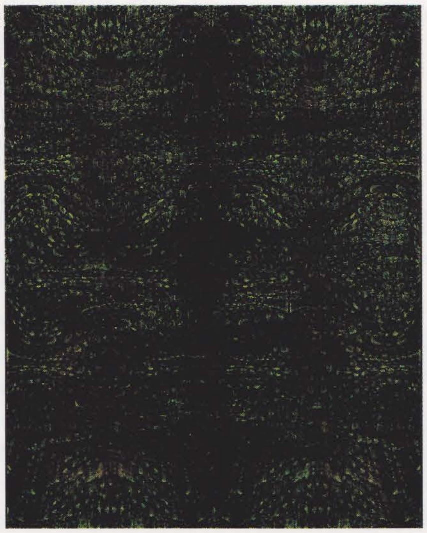


Figure 1.30 The body texture

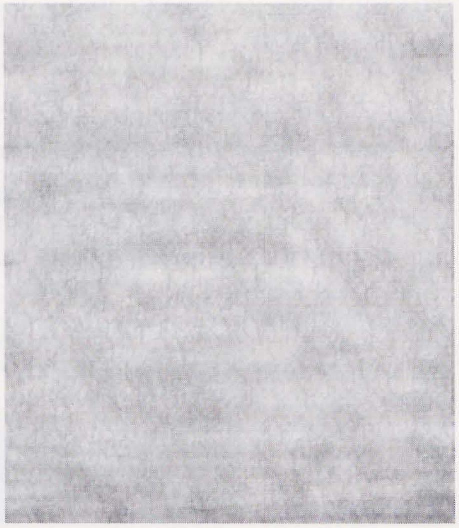


Figure 1.31 The spike and toenail texture

(even if he is too dumb to appreciate it.) Of course, he looks a bit pale. Our next step is to put a little color in the old boy's cheeks, and everywhere else.

Surfacing the Stegosaurus

Surfacing is the final step. Realistic colors, textures and shading are essential to creating a lifelike dinosaur. To surface the Stegosaurus, I created four unique textures in Corel Photo Paint. As I do with most of my textures, I hand painted each of these using the Air Brush tool. I then used fractal fills to finish the textures. Each texture was used twice, as both a texture map and a bump map.

The first texture I created was for the plates along Wally's back. I wanted to create the impression of folds and enhance the leaf shape of the plates, giving them more depth. To do this, I painted a veined texture with dark values for the folds. Once I had hand painted the basic surface, I used Gaussian Blur and smoothing to blend the colors.

As I mentioned, I applied this texture as a bump map and a texture map. To create the texture for the legs I began by drawing a basic grid pattern for the scales. Then, in each square of the grid, I used a fractal fill. Next, I used the Air Brush tool to add the lines between the scales. I then used the mesh warp effect to create the varying patterns of the scales. Finally, I adjusted the sharpness and noise to create exactly the effect I wanted. The final image map I shown in Figure 1.29.

To wrap the texture around the legs properly, I used cylindrical UV mapping, rotating the seam to the inside of the leg. The texture of the body is identical to the leg texture, except that I used the Brightness and Tint brushes to add additional coloration and pattern. See Figure 1.30.

I again used cylindrical mapping, rotating the seam to the belly of the stegosaurus. For the toenails and spikes, I began with a simple fractal fill. Over this, I painted a faint wrinkled texture with the airbrush using a high transparency setting, to simulate growth rings. See Figure 1.31.

The tongue is simply a dark pink color with the Orange bump map that comes with trueSpace. Remember how we rotated the eye spheres so the tops pointed out to the sides? Now we can easily paint directly onto the eye with the Paint Face tool. Simply create a series of concentric rings, and add the black pupil once you've painted the entire sphere a shiny transparent amber color. See Figure 1.32.

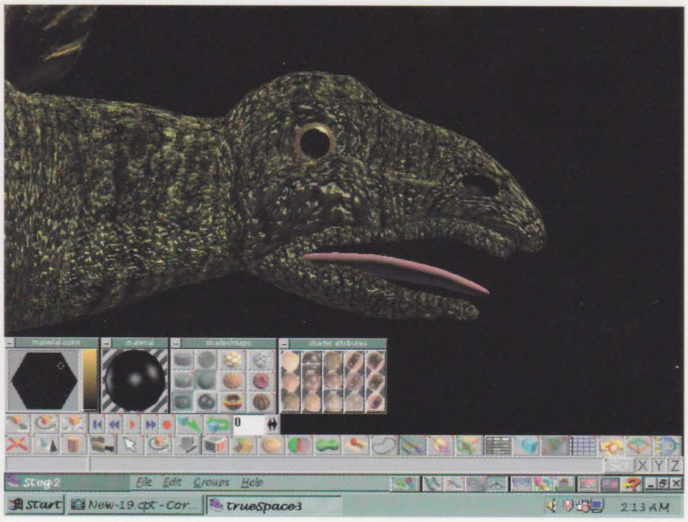


Figure 1.32 Rotating the top of the sphere outward makes it simple to paint the pupils

There you have it, back for a return engagement after 150 million years it's Wally the Stegosaurus! To see Wally in full dress, take another look at Figure 1.1.

Keep it Simple

Now wasn't that easier than cloning dinosaur DNA? Sometimes creating believable 3D models calls for incredibly precise and difficult methods. Many times though, satisfactory results can be achieved with much simpler (and faster!) methods. This gives you more time to spend on the hard stuff, and believe me, some assignments you get will drive you to the hard stuff.

The current incarnation of truespace3 isn't on a par with the likes of SoftImage, LightWave or MAX when it comes to complex animation and rendering. Nonetheless, it is a very powerful tool that is highly intuitive and user friendly. Also important, it's within the grasp of nearly anyone determined to create serious 3D animation. By mastering trueSpace3's strengths, you can achieve great results that may even surprise you!

Darris Dobbs is a professional 3D artist and writer from Wichita Kansas. He is the co-owner and creative director of HieroglyFX Design, a full-service 3D graphics and animation studio. Darris has a degree in Animal Science and a background working with a wide variety of animals. He takes advantage of this experience to create his specialty; lifelike, photorealistic animal and creature models. He also specializes in creating creature models, expressive caricatures and recreating historic settings. He is coauthored of "Creature Creation with trueSpace 3.0", published by Charles River, Inc.

Photoshop

Prehistoric Creature Surfacing

By Geoffrey Smith

Photoshop has long been prized by 3D artists as one of the most versatile programs for creating image maps. Its layers and intuitive, uncluttered interface make it a favorite. In this article, we'll discuss the step by step process of painting realistic surfaces for a character named 'Gorg.' First, let's get to know Gorg a little better.

Getting to Know Gorg

Gorg represents the amalgamation of a muscle-bound human and a Uromastyx Lizard (an Egyptian desert lizard). He stands roughly 12 inches high, and weighs in at just over 16 ounces. He's approximately twenty-two years old in Gorg years (which would make him about 108 in human years). Gorg is the proud leader of his small group. His 'job' is to help educate, secure food and lodging, and to protect all the members of his small tribe.

Three times a year, Gorg entrusts the tribe's protection to a younger male guardian while he seeks new hunting grounds and perhaps new lodging. What is more important, during these 'walkabouts' Gorg seeks the Great Gorgona, spiritual leader of all Gorg-like creatures. When he is successful, he and his small tribe will ascend to the ranks of the high priesthood of Gorgona. Gorg has been close many times ... he knows that one day he shall succeed, for it is his destiny. It's at this vulnerable time, when Gorg is pursuing his quest, that he finds himself entangled (quite literally) in yet another adventure. Lacking the protection and support of the rest of his tribe, Gorg is wide open to an attack from the dreaded Golden Serpent, the tribe's most feared enemy!

Our hero is no 'pushover' though. As creatures go, Gorg is one tough S.O.B. He's extremely strong, and very fast. He's also endowed with fierce claws and extremely sharp teeth. Gorg's most formidable defense, however, is his incredibly tough skull. He uses this as a battering ram, rupturing the internal organs of his opponent. Since we'll be surfacing Gorg's thick skull, it will be our job to communicate its nature to the viewer. What's it made of? What does it feel like? How does it react to light, and where has it been? What type of geography was it designed for? I know it seems like a big job, but it's well worth the struggle. Take a look at Figure 1.1, which shows Gorg without any image maps.

Gorg has been meticulously modeled to withstand even the harshest environment. I mean, his neck is nearly as thick as his waist! He's a very tough little creature, so what we'll need to do is to find Gorg's visual counterpart from within Mother Nature's vast library of biological examples.

We need to create image maps that convince the viewer Gorg's

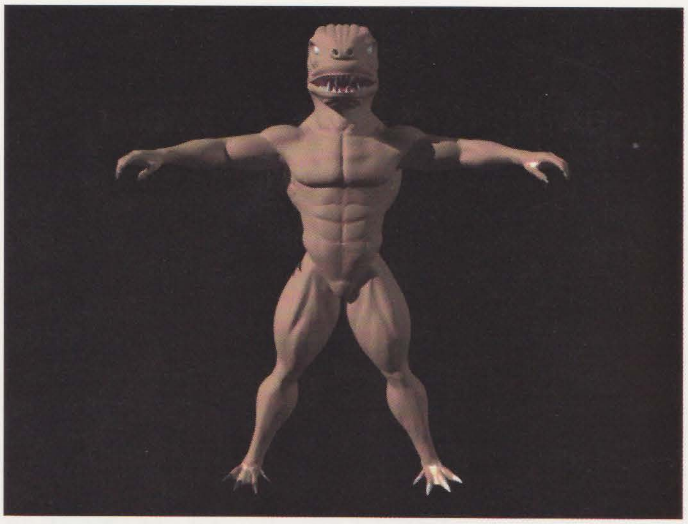


Figure 1.1 Gorg as a Naked Model

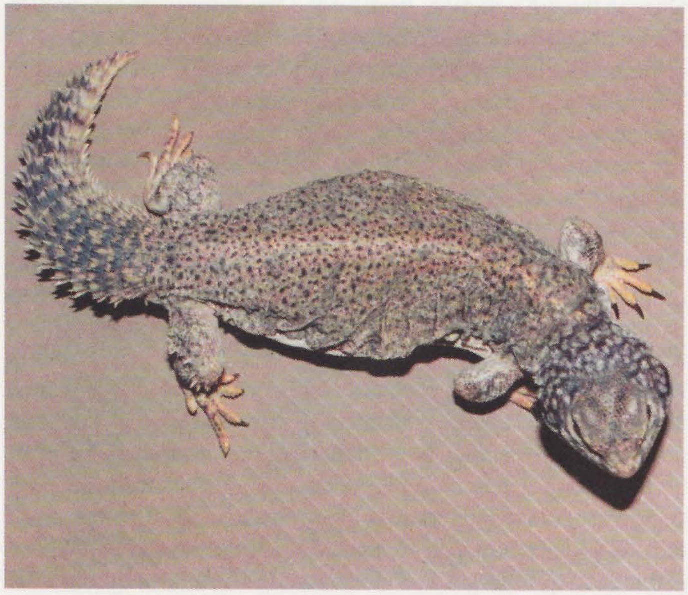


Figure 1.2 The reference image of the Uromastyx Lizard

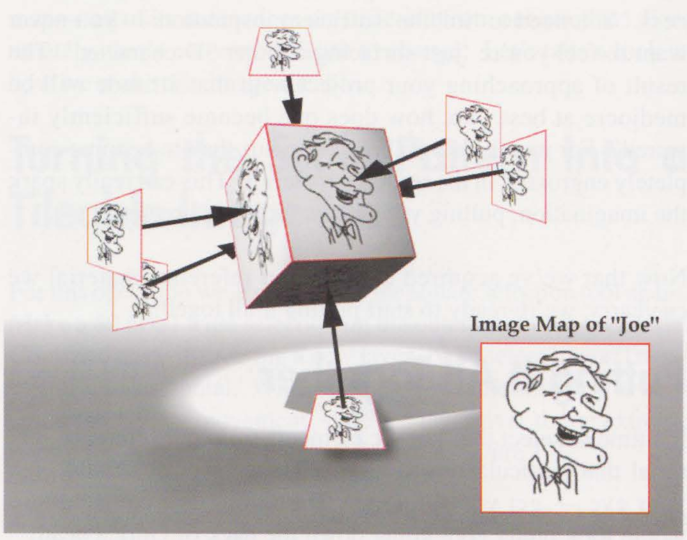


Figure 1.3 Cubic Mapping in Action

head is capable of knocking down a brick wall and coming out the other side unscathed. Let's go for it!

Acquiring Reference Material

After searching far and wide to find a lizard that will be an appropriate fit for Gorg's head, we discover the Uromastyx Lizard. Figure 1.2 shows the scanned image. Our job will be to put the skin of the Uromastyx onto the model of Gorg's head.

We may need to search extensively for good photos of the Uromastyx, but don't despair. If you possess a library card and a sturdy book bag, you're half way there. 'And just where should we look once we get to the library?' I'm glad you asked. The children's section is definitely the best place to acquire fantastic pictorial reference material. To think ... for years I've been wasting my precious time in the adult section of the library only to discover that the children's library is where the good stuff is!

Once in the kid's section, look for the Eyewitness Books, and/or the Look Closer series. Whether you're creating creatures, cities or biplanes, I've found these books to be an absolute necessity. They feature amazingly crisp color photographs, which make perfect source material.

At times, you already have great source material on hand. The image in Figure 1.2 above is from a photograph taken by Bill Fleming who is, among other things, a Herpetologist specializing in threatened and endangered species. The Uromastyx in the image was kind enough to pose for a few photographs.

Now that we have source material for the color image maps, we need some reference material for the muscles. Gorg is a muscle-bound creature, so we'll need to find images of big, buff, bodybuilding dudes. We needn't go any further than the local supermarket magazine rack to find muscle mags galore. These will supply all the reference material we need to create muscle and vein maps later. Since Gorg lives in a semiarid desert area, I picked up some great books on desert lizards and reptiles too.

I can't overstress how vital good resource material is to success. You need to 'imbibe' sufficient inspiration — you never want to feel you're 'just surfacing another 3D character.' The result of approaching your project with that attitude will be mediocre at best. So, how does one become sufficiently inspired? For me, there's no better impetus than to become completely engrossed in the resource material. This can really spark the imagination, pulling you in new creative directions.

Now that we've acquired all the great reference material we can carry, we're ready to start putting it all together.

Putting It All Together

It's time to select the specific elements from our reference material that particularly suit Gorg. These features should grab your eye — get you thinking: 'Hmmmm, that color pattern would look pretty cool going down the back of Gorg's head!'" Dealing, as we are, with a fantasy creature, we're free to mix

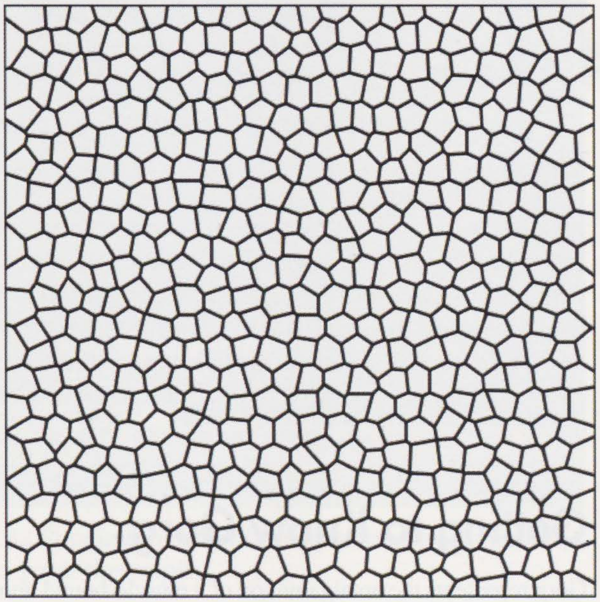


Figure 1.4 The basic scale pattern

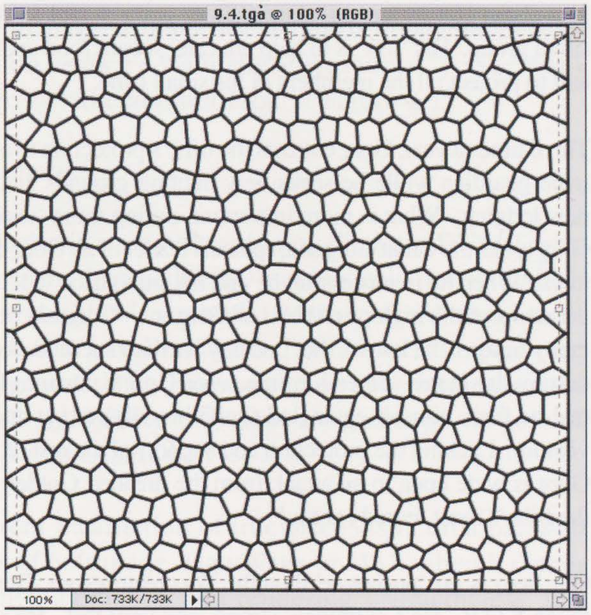
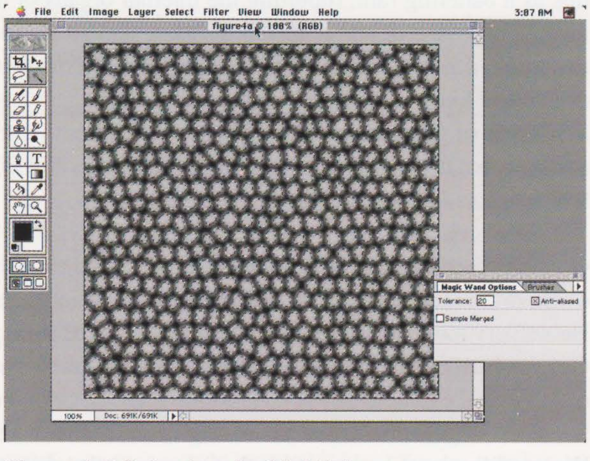


Figure 1.5 Removing the border



Tolerance: 20
☒ Anti-aliased
☐ Sample Merged

Figure 1.6 Selecting the highlights

and match the most interesting elements from our resource material.

Gorg being a lizard creature, we need to clothe him head to toe with scales. Once again we'll dig into our resource material — we want to discover Mother Nature's logic behind these scales. Actually, a wide variety of scales can be found in nature — teardrop shapes, diamonds, octagons, and so forth. We have a wide variety to choose from. Once we've chosen a great scale pattern to use, we need to choose the best technique for applying it seamlessly to the entirety of Gorg's skin.

Preparing Gorg for the Scales

This is the easy part. We need a place to put our seamless image maps. First, extract the Gorg Head model in the MayPhoto.zip file from the Serious 3D web site (http// :www.serious3d.com/support.html). Then, using the 3D program of your choice, you'll need to select all the skin surrounding Gorg's head. Be sure not to select his teeth, eyes, nostrils, tongue, or gums. Scaly teeth are not the most attractive things you'll ever see.

When you've got the skin surrounding Gorg's head selected, you need to name this area — call it 'skin' or something equally imaginative. Save the model, and you're ready to start on the scales.

We want the scales to cover Gorg's entire head, but how do we go about applying them? This could be a real surfacing nightmare if not handled properly. The scales must match up with one another to form a seamless surface, yet show no texture map stretching! How on earth can we do this? Simply enough as it happens, using cubic image mapping. Cubic mapping allows us to map one image equally to all six sides of an object, even when the object is very organic in shape (like Gorg's head). Take a look at Figure 1.3, to get a better idea of how this works.

You can see that a Cubic map does a great job of applying basic surfaces to organic objects.

Note: For spline-based Programs like Animation Master that don't have offer cubic image mapping, simply flatten the object of the head and tile the image maps onto its surface.

Since scales appear as 'little bumps' on a creature's skin, let's begin with the bump map. We need this bump map to be a repeating, tileable map, so it'll take a few simple steps to get the result we want. Let's get started.

Creating a Seamless, Tileable, Bump Map for Gorg's Scales

1. Open Photoshop, and create a 500x500 pixel image with a white background. Make sure that black is the foreground color and white is in the background. We need to use one of my favorite Photoshop filters, Stained Glass.

2. Select the stained glass filter under: Filter/Texture/Stained Glass, and apply the following settings in the dialogue box:

- Cell Size: 10
- Border Thickness: 4
- Light Intensity: 7

The result of this operation should look like Figure 1.4.

3. This will give us a nice, chaotic pattern with a black border surrounding it. We're not quite there yet, though. We're going to have to get rid of this black border by cropping the image.

4. Using the Cropping Tool, select an area about four or eight pixels in from the outer edges. We want to leave half a scale at the edges, so the image is seamlessly tileable. Once you get the right placement, hit Return. The image will be cropped as shown in Figure 1.5.

5. We need to soften these scales a bit, giving them a wider range of gray, so the bump isn't too sharp. We don't want Gorg's scales to look like they were created with a cookie cutter. To do this, select the Gaussian Blur filter and set the Radius to 3.1.

6. The scales still look a little too 'washed out,' so let's crank up the contrast a bit, by selecting the Brightness/Contrast controls. Set the Brightness to -55 and Contrast to +39. So far, so good, but it's still a little too gray. We need the highlights to really stand out — then our 'scale bumps' will actually look like bumps, and not a smooth surface.

7. Select the Magic Wand tool with a Tolerance of 20, and click on the highlight (the light areas) of one of these bumps. Now choose Select/Similar. All the center highlight areas of this image map will be selected, as shown in Figure 1.6.

8. Let's hide those distracting little 'marching ants' by choosing: View/Hide Edges. We'll need to soften the edges of this selection a bit though. Choose Select/Feather, setting the Feather Radius to 2 pixels. Now choose Brightness/Contrast again, and set the Brightness to +57 and the Contrast to +37.

It's looking good, but we still can't use this as a tileable image map — all of its outer edges are different from one another! Fortunately, that's not very difficult to change. Let's take a look at how we make this image tileable.

Turning the Scale Pattern Into a Tileable Image Map

For this operation we'll need to use the square selection tool again. Make a 40 pixel wide selection on the outer edge of the left side. Copy and paste it, creating a new layer. Now select Layer/Transform/Flip Horizontal. While holding down the shift key to constrain the layer's movement, slide the layer over to the extreme right edge of the image map, as shown in Figure 1.7.

2. You'll notice that the scale pattern on the outer left edge doesn't quite match up with the rest of our image map. To fix this prob-

lem, select the Erasure Tool (E), and set it to an Airbrush. Set its Pressure at 63%, with a Diameter of about 20 pixels, and a Hardness of 0. Then, begin to remove the troublesome edge a little bit at a time, creating complete scales as you move the eraser. Of course, it doesn't always work out that way, but we can fix these little imperfections with the paint tools. Once you've erased the hard edge, flatten the layers by choosing Layer/Flatten Image.

4. To fix the areas where the size and shape of the scales have become distorted, use a white Airbrush with the Pressure set to about 26%, a brush Diameter of about 13 pixels and a Hardness of 5%.

5. To complete the bump map, repeat steps 1 through 4 for the vertical section.

Now that we've finished creating our tileable bump map for Gorg's scales, we need to give it the 'tile test' in Photoshop.

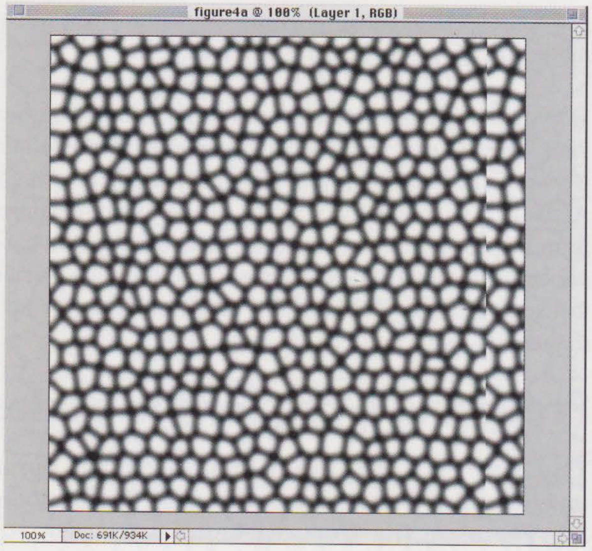


Figure 1.7 Layer slid to the Far Right

The Photoshop Tile Test

1. To begin, make sure that your image has been flattened. If it isn't yet, select Layer/Flatten Image.

2. Select All, and define this selection as a pattern by selecting Edit/Define Pattern

3. Since we're dealing with an image that's 500 by 500 pixels, we'll require a new image at double those dimensions to allow us to see how the edges of this image meet each other. Select File/New, and enter a width and height of 1000 pixels.

4. Select Edit/Fill and enter the following values in the dialogue box:

- Contents:
- Use: Pattern
- Opacity: 100%
- Mode: Normal

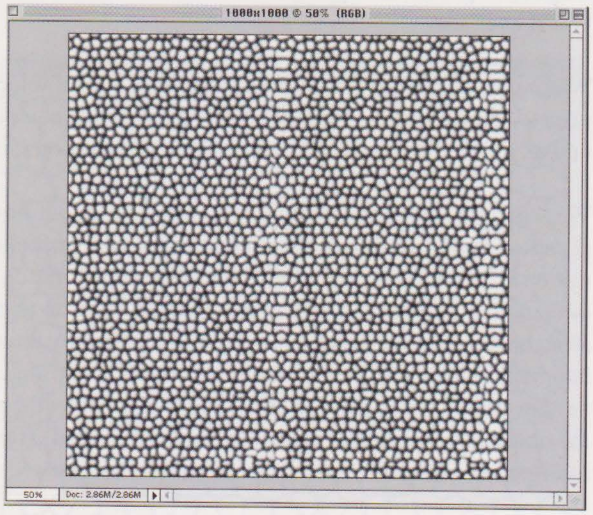


Figure 1.8 The Photoshop tile test

Figure 1.8 shows the result of this operation.

If there are any noticeable tiling problems, go back to the 'pre-test' image, and fix the trouble areas using Photoshop's painting tools. Figure 1.9 shows what the final bump map should look like.

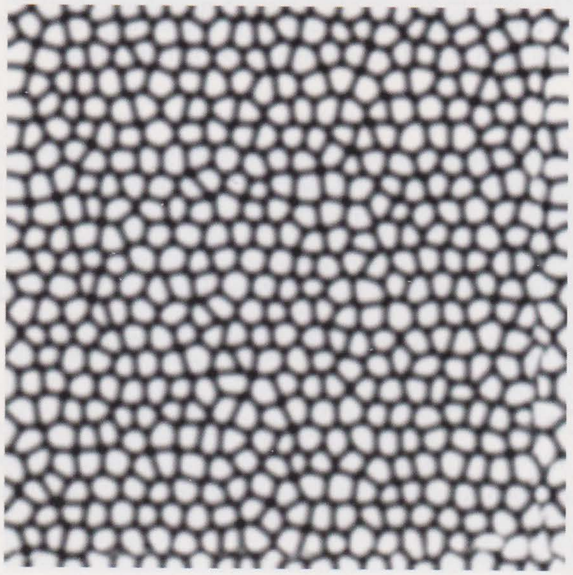


Figure 1.9 The Finished Scale Bump Map

Now that we have a perfectly seamless, tileable Bump map for Gorg's scales, we can begin making our accompanying Diffusion and Specularity maps. Fortunately, we can use the Bump map we just created for the foundation of these image maps.

Creating a Scale Diffusion Map

We can create a diffusion map by simply duplicating our new bump map, and making some minor changes to it. Let's get started.

Exercise: Creating a Diffusion Map

1. Select the bump map layer we just made, and duplicate it.

2. Now select the Brightness/Contrast controls, and enter the following values:

- Brightness: +85
- Contrast: -85

3. You should now have something similar to Figure 1.10.

All we need to do now is name this layer 'Diffusion,' and save the Photoshop file. The next thing we'll do is create the specularity map.

Creating the Specularity Map

The specularity map can be created from the bump map, just as we did with the diffusion map.

Exercise: Creating a Specularity Map

1. Make another copy of the bump map layer, by duplicating it. Name this layer "Specularity".

We need to lower both Brightness and Contrast of this layer, or the specularity will be too high. Gorg's scales would be much too shiny.

2. Select the Brightness/Contrast control panel and add these values:

- Brightness: -100
- Contrast: -90

Finally, we need to export each of the image maps as separate files. Do the following for each image in turn — Select each entire image (whether it's the bump, diffusion or specularity layer) by choosing Select/All. Copy the layer. Now select a new file, pasting the layer into the new file. Save the new files respectively as Gorgscalebump, Gorgscalediff," and so on.

That's all there is to creating photorealistic scale maps that are both seamless and tileable. Now let's apply these maps to Gorg's head. Load the Gorg Head model you saved earlier into your rendering program, and import the image maps you just saved. Then apply the image maps, using Cubic mapping, to the Gorg Skin surface. Be sure to apply the bump, specularity and diffusion maps. Look at Figure 1.11 to see what Gorg should look like once the scale maps have been applied with the cubic mapping method.

Let's now apply some color depth to him.

Applying Color Depth

Photorealistic color depth appears as the culmination of all your im

Figure 1.10 The Scale Diffusion Map

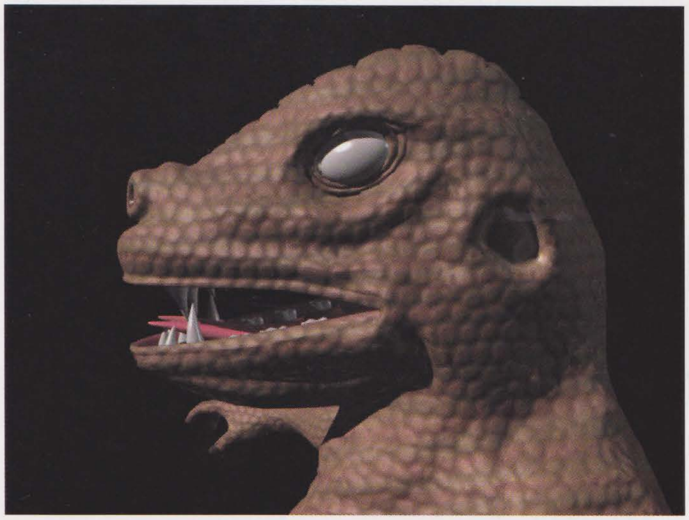


Figure 1.11: Gorg with his scale maps applied

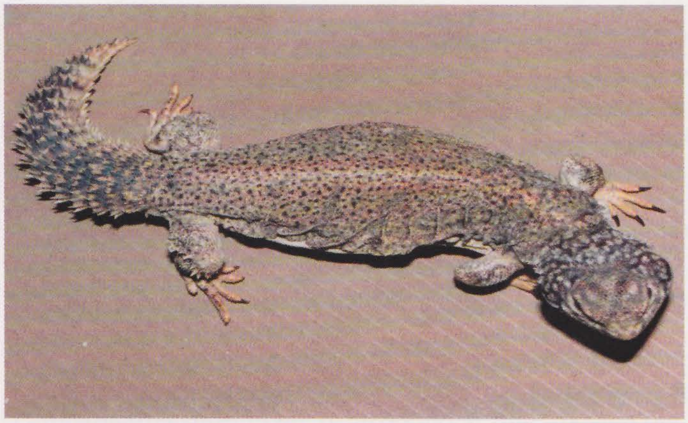


Figure 1.12 The Reference material for creating realistic color depth

age mapping techniques. When color, diffusion, specularity and bump mapping are successfully combined, the results can be very realistic. As we can see from Figure 1.11, the scales really seem to be working well, but the model still lacks realism. It hasn't yet lost the 'computer generated' look. We can improve this situation by enhancing our realistic color depth. To do this, let's refer to our photographic reference material.

Figure 1.12 shows some of the reference images available to supply ideas for Gorg's surfacing. If we want to achieve photorealism, it helps to have some good reference photos to guide us.

We're going to need some good templates of Gorg's head so we know just where to apply the color. After all, we don't want the dark circles under Gorg's eyes to end up on his chin. So, how do we go about creating these templates? Let's take a look.

Preparing Gorg's Head For Planar Mapping

Since we'll use planar mapping to surface Gorg's head, we're going to need to 'split' his head into its respective planes. We'll separate the front, sides, back and top of the model, as shown in Figure 1.13.

Once we've got each of the sides selected, we need to give them each a unique name. Then, let's save the model as something like 'Gorg2.' Now, begin rendering out some templates of Gorg's head to serve as reference images when we painting the maps. Render front, sides, top, and back from the orthographic view if your 3D program allows you to do this. Otherwise, you'll need to 'screen capture' the wire frame images from your modeling program. Figure 1.14 shows the side template for Gorg's head.

If your 3D program does allow you to render from the orthographic view, give each view of the skin selections different colors. This will enable you to easily tell where one portion ends and another begins. If you can't render from one of the orthographic views, then it's a good idea to do some renderings from the perspective view. Just be sure to set the zoom on your camera to around 800 — this will flatten out the perspective of the model so it matches the wire frame image. The reason we need to have rendered versions of the head is so we can tell exactly where the lips, eyes, nose, ears, etc. are located on the model. This knowledge will be invaluable when we begin painting in these details.

Once you've rendered out all of your templates, you're set to begin painting. First, load the views into Photoshop. Now crop each of these template images to the border of the selection you want to paint. See Figure 1.15 for an example.

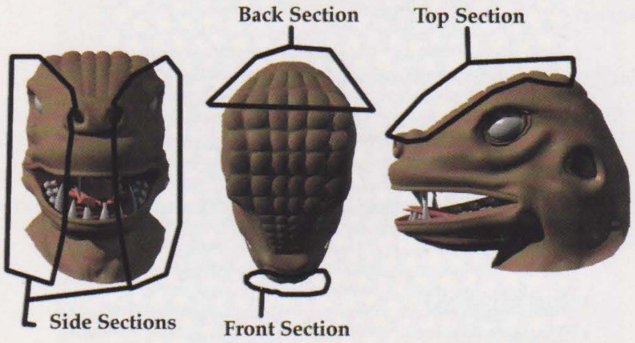


Figure 1.13 Gorg's head split up into planes

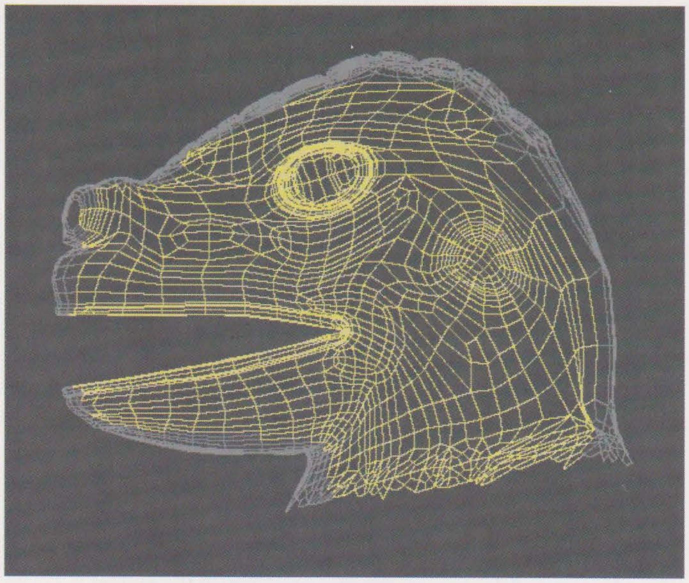


Figure 1.14 Wire frame view of Gorg's head

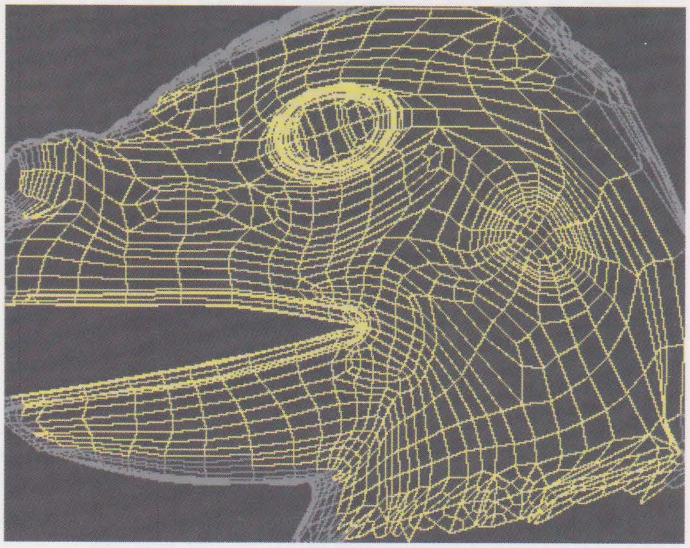


Figure 1.15 The side view template cropped down to the selection area

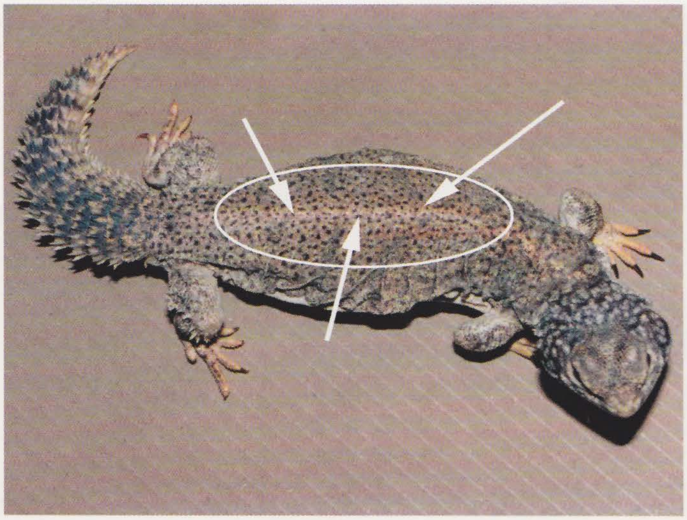


Figure 16: The undertone color for Gorg

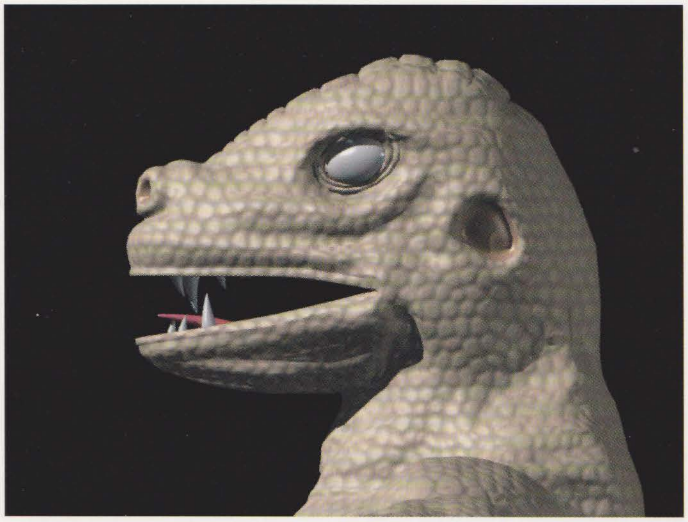


Figure 17: The combination of color and diffusion mapping

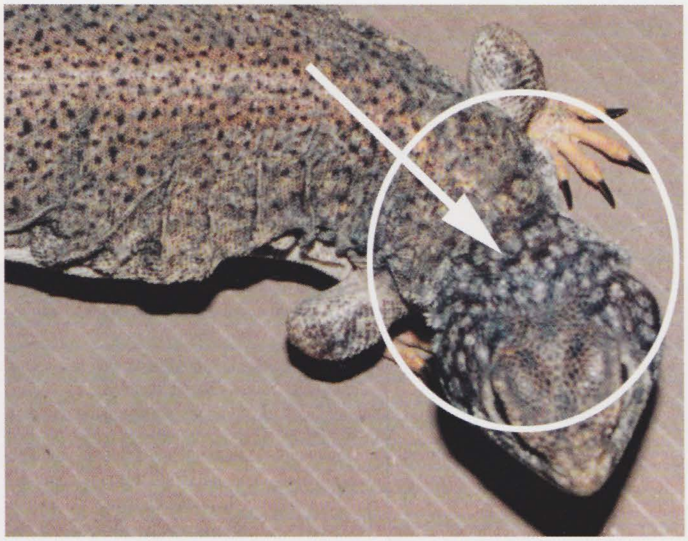


Figure 18: Reference skin pattern for Gorg's head

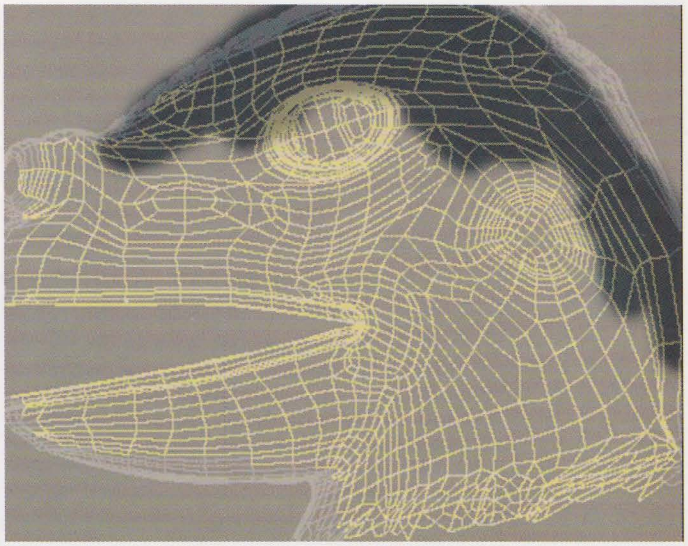


Figure 19: Applying the base color to Gorg's head

Now we're ready to start painting the color depth on Gorg's face.

Painting Gorg's Image Maps

Exercise: Painting Gorg's base color

1. First, we need to find a good base color for Gorg's head. This is kind of like preparing a canvas with a base coat of paint. To find a good base color, take a look at the reference image of our Uromastyx Lizard again. See Figure 16.

2. Once you've selected the base color (RGB values: 198, 176, 135) with the eye dropper tool, create a new layer — name it Color". Then Select All, and fill this layer with the new base color.

3. Now select the Brightness/Contrast control, and set the Brightness to +35 (leave the contrast alone). Increasing the brightness of the base color compensates for the diffusion map that we'll be creating. OK, let's create a new layer named Diffusion.

4. While in this new diffusion layer, click on the color swatch, and set it to these RGB values: 191, 191, 191. Fill the new layer with this color.

5. Copy each of these layers to separate files. Save the color map as Gorgsidecolor, and the diffusion map as Gorgsidediffusion." This is also a good time to save the

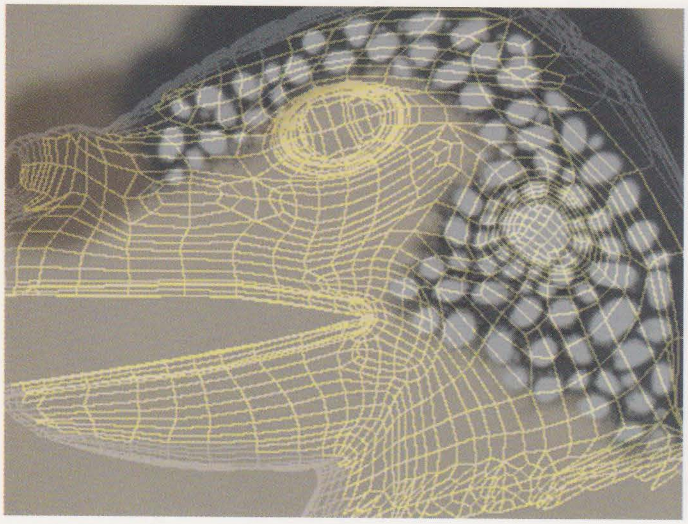


Figure 20: Looking through the color layer to the template image

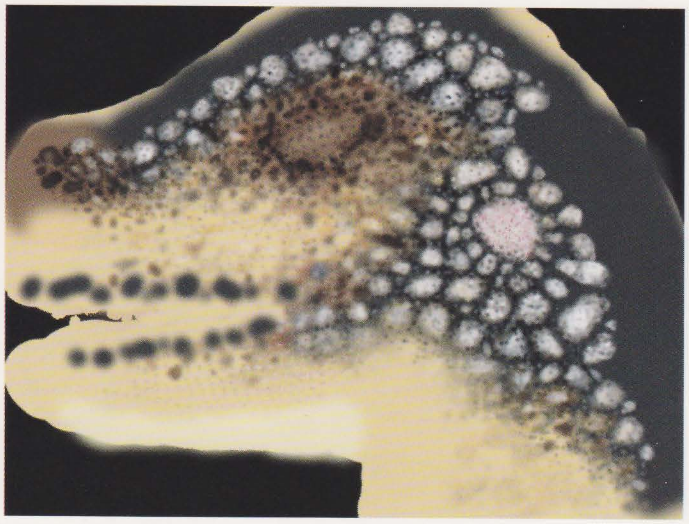


Figure 21: The boundary of our color map

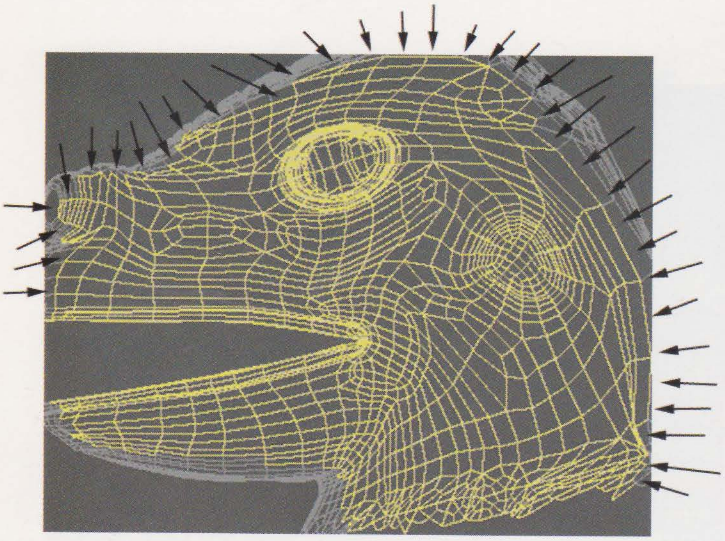


Figure 22: The final color map for the side of Gorg's head

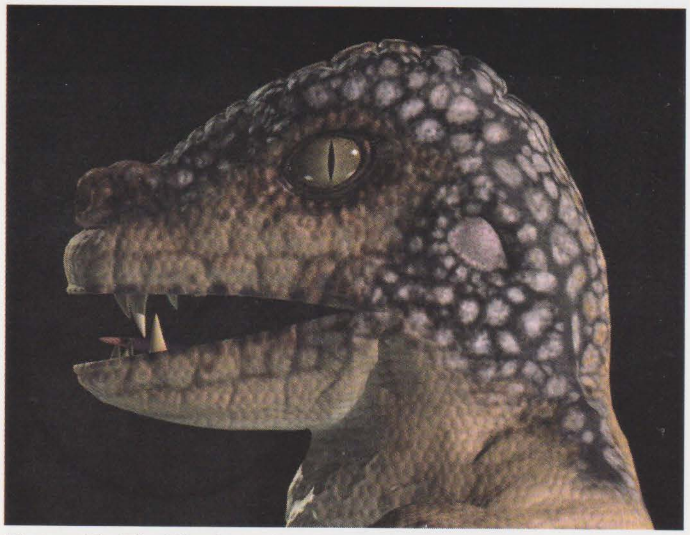


Figure 23: The Final rendered Image of the Side of Gorg's Head

entire Photoshop document as Gorgsidehead.psd.

Note: If your 3D application doesn't allow you to use diffusion maps, simply ignore steps 5 through 9.

6. Back in your 3D application, load both color and diffusion maps. Map them to your model so you can see what this base color will look like. Render out a test image of Gorg's head, as shown in Figure 17.

Let's open this test render in Photoshop, and compare it with the reference image of our Uromastyx lizard. You might need to adjust the base color a bit, to match the source image. Once you get a good match between your test render and the reference image, you're ready to move on to creating some skin details.

Creating Skin Detail

The skin details we create now will transport Gorg out of the computer graphics world and into reality.

Exercise: Painting Gorg's skin details

Referring yet again to the reference image of our Uromastyx Lizard, find a good skin pattern to copy that will appropriately adorn Gorg's head. Figure 18 shows the area that should serve our purpose nicely.

2. We'll start with the side image map for Gorg's head. First, we need to select a good base gray color of RGB: 45, 47, 51. Be sure to write down these RGB values. We'll use this bluish-gray color at the extreme edge of each of the four views (front, side, back, and top) to make the surfaces seamless.

3. Now create an airbrush with the following settings:

- Diameter: 20 pixels
- Hardness: 0%
- Spacing: 5%
- Pressure: 36%

- Default Angle and Roundness

4. Keeping our fingers on the Undo keys ("Command Z" on the Mac or "Control Z" on the PC) let's do a test of this airbrush and color in our color layer, just to get the look and feel of it.

5. Set the color layer Opacity to 50%. By making this layer transparent, we can see exactly where we'll be applying the color on our template.

6. Now spread the gray/blue color from just after Gorg's nose to the back of his head, as shown in Figure 19.

Be sure to set the airbrush to 100% pressure when painting on the edges of the template so it will seamlessly merge with the other image maps.

7. Let's add some white spots on top of the gray color, to create a pattern like the one on Uromastyx's back (see Figure 20). Many of the spots covering this area are almost white, so create the spot color using RGB: 207,207, 209. Use these airbrush settings.

- Pressure: 36%
- Diameter: 13 pixels
- Hardness: 5%
- Spacing: 5%
- Default Roundness and Angle

8. Set the color layer Opacity to about 50% as shown in Figure 9.20.

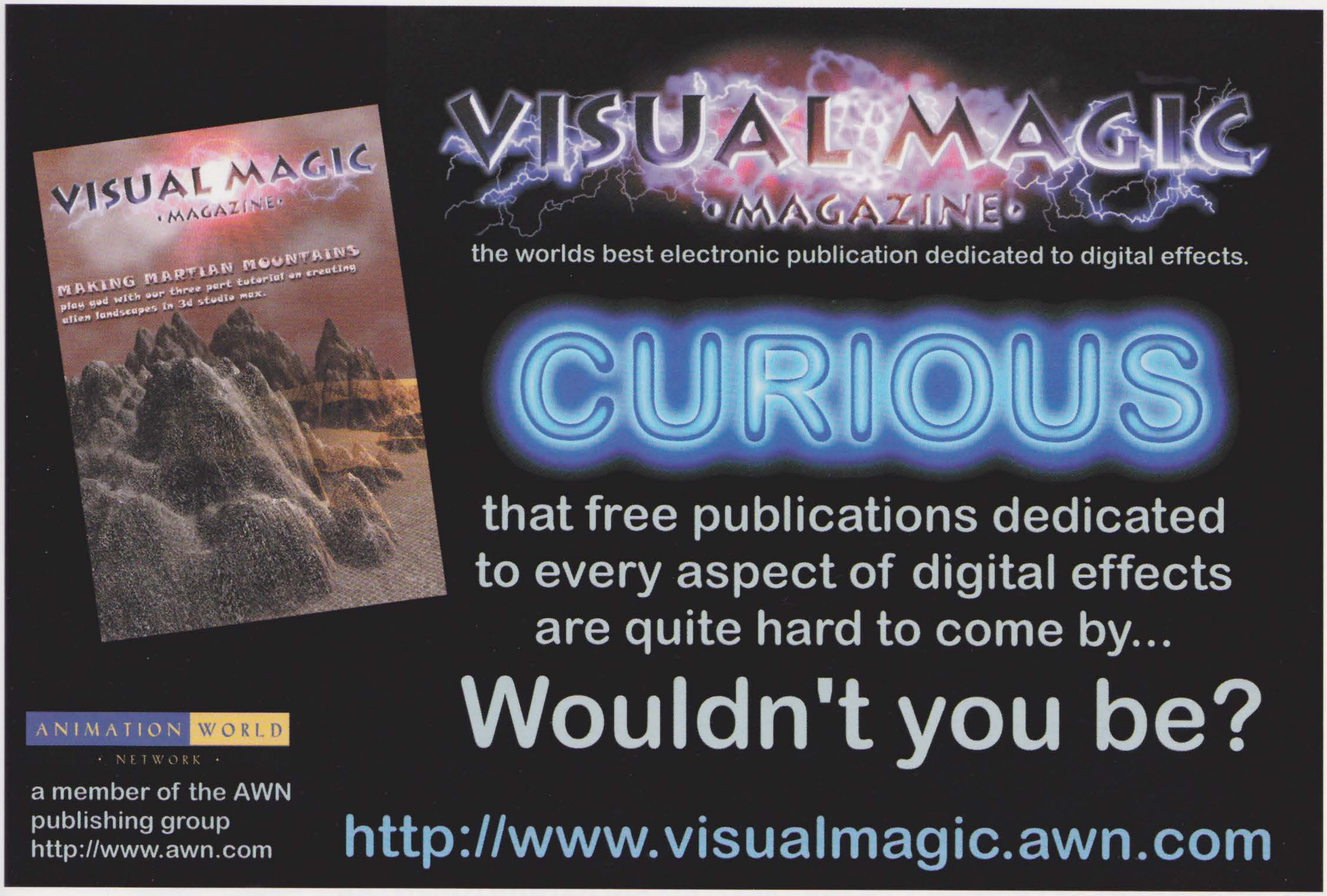
9. Now, begin adding the white spots to Gorg's head. Be sure not to put any white spots on the boundaries of the color map, to avoid seam problems. To see where the boundary edge is let's take a look at Figure 21.

Once we've created the spots, we'll need to break up their consistency with some smaller details, as shown in Figure 22. I've also added more spot patterns around Gorg's eye area and lips.

So far we've only covered the planar mapping of one side of Gorg's head, but the concepts already discussed apply to the mapping of the front, top, and back of the head. Figure 23 shows what the results look like after we apply the color maps we just made, along with the scales we made in the first part of this article.

As you can see, a great deal can be accomplished with the use and duplication of Photoshop's layers. When it comes to creating realistic surface textures, judicious use of layers can save a great deal of time. Layers also allow us to align different image maps with precision.

This exercise has been a lot of fun. What is more important, we've really sharpened our surfacing skills. It didn't take all that long, and the results are quite gratifying. You can see the importance of good photographic reference material, careful selection of the different planes of your model, and of course, a good model to work with. Armed with this knowledge and your favorite 3D application, you can create some incredibly lifelike 3D creatures!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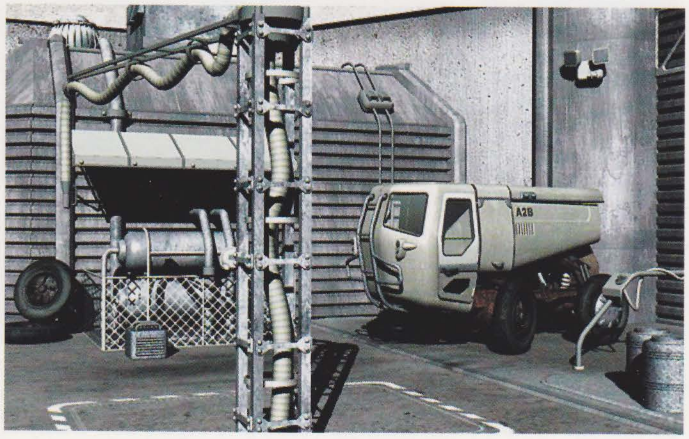
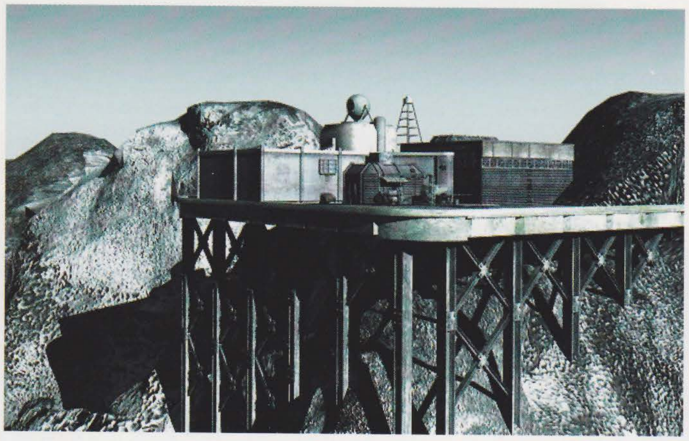
Feature Artist

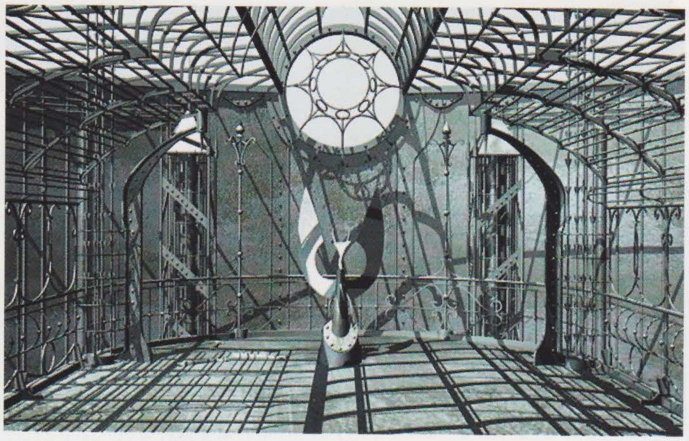
Istvan Ipely is a very talented 3D artist who specializes in interactive game development. This gallery contains a brief portfolio of images he created for his third CD-ROM adventure game, Satin Rift. Most of these are environments designed for sprite-based characters to move within, hence the camera angles are restrained. All of these scenes were modeled and rendered in 3D Studio MAX R1. Istvan works for XL Translab, a progressive effects and animation house located in Rockville, Maryland. To see more of his work, visit http://www.charm.net/~ipely.



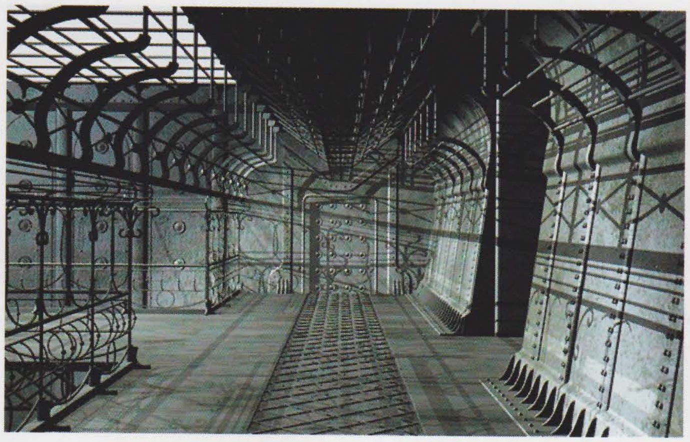
This scene took a lot of fiddling with the lights to get it to look like a bright sunny day; lot's of polarized light. The sort of day when you're always squinting, even if the sunlight isn't directly in your eyes.



The rocky mountain side was created by hand, pushing and pulling the vertexes of a grid object, then blending different rock textures together. This shot is zoomed in from a pretty vast mountain scape, so the detail is pretty high. However, this is as close the camera can get to the rocks before they start looking fake.



This image really strained my system, but I wanted a very high level of detail. Each of the beams is an individual object, there are no opacity maps. The harsh light casting stark shadows creates the illusion of a very sunny day.



I love that weathered iron look. Very Gothic, don't you think?

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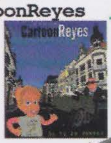

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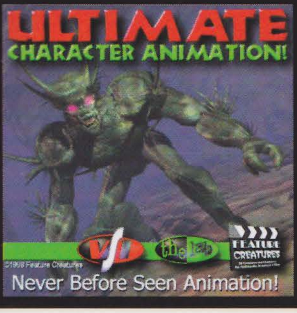

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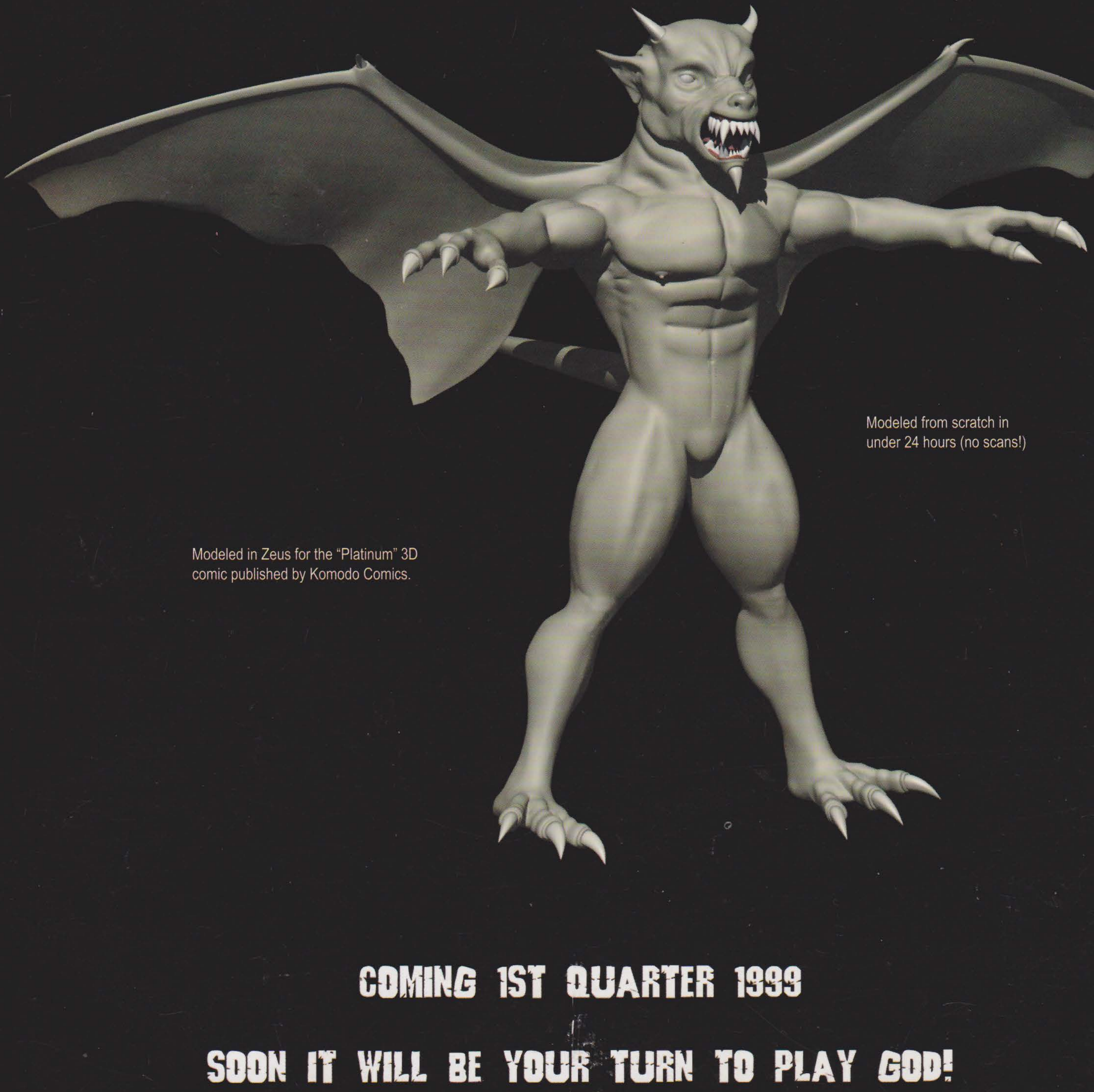

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